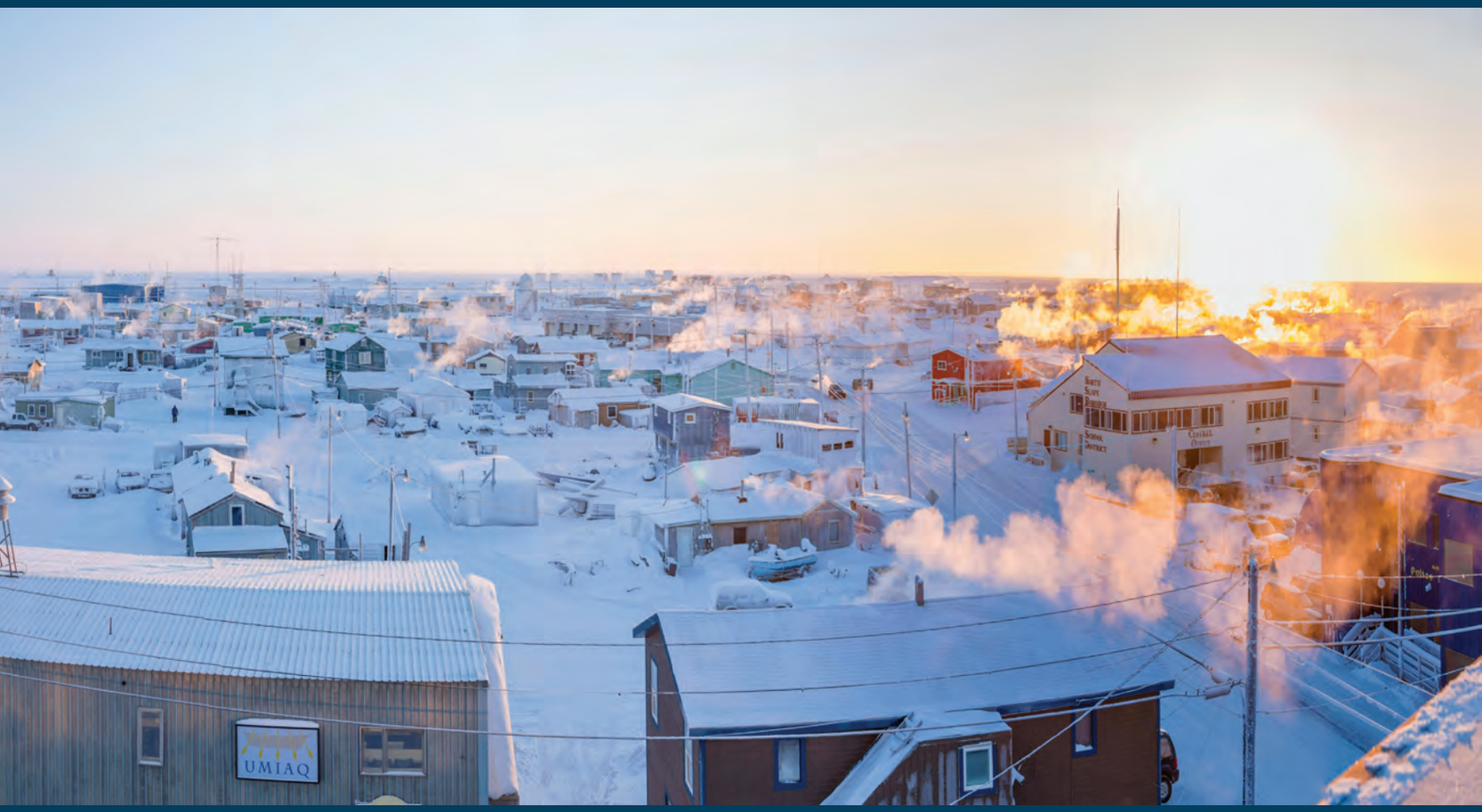
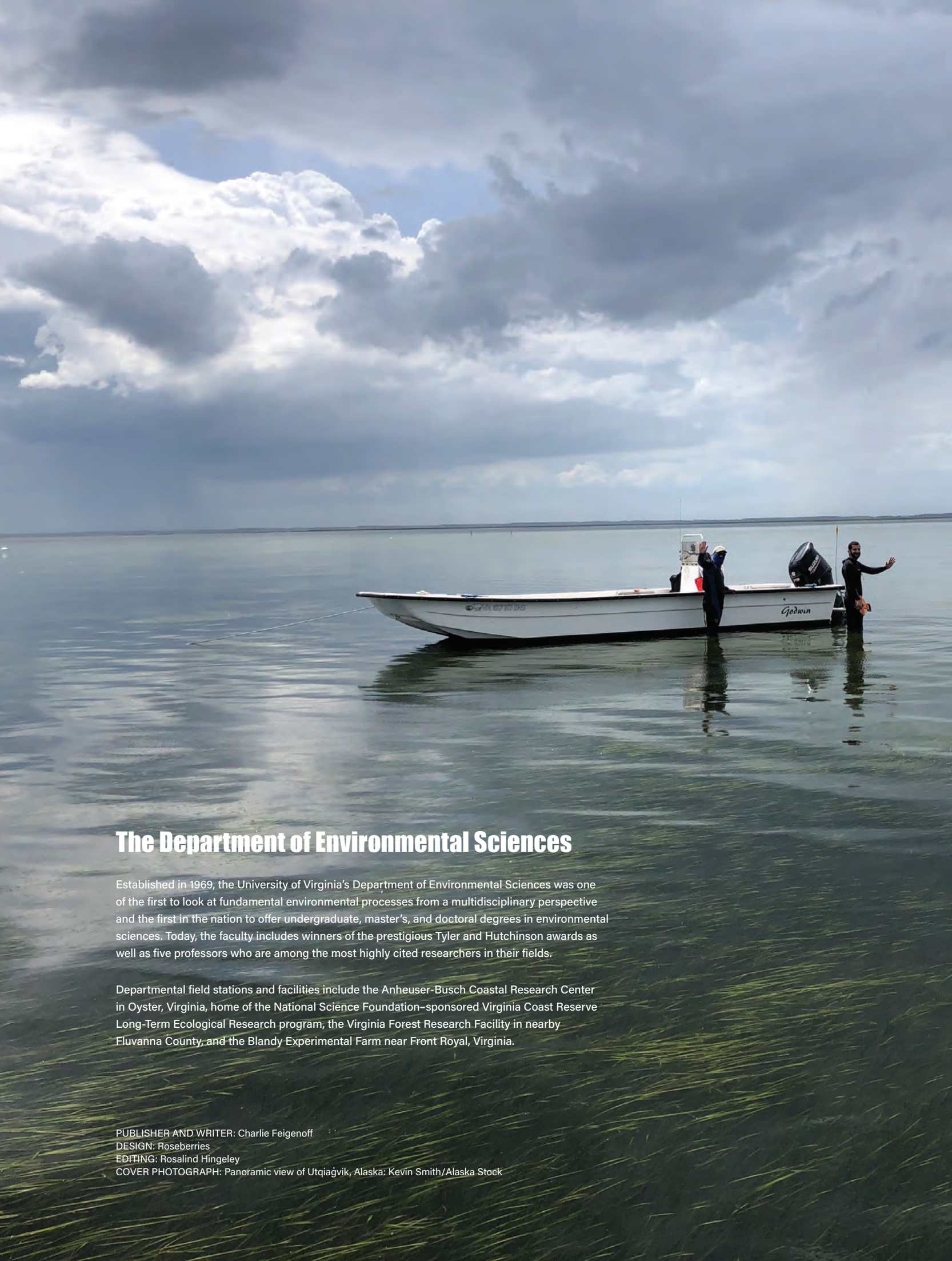
Environmental Sciences

AT THE UNIVERSITY OF VIRGINIA



Rethinking What We Do

2019–20 ANNUAL REPORT



The Department of Environmental Sciences

Established in 1969, the University of Virginia's Department of Environmental Sciences was one of the first to look at fundamental environmental processes from a multidisciplinary perspective and the first in the nation to offer undergraduate, master's, and doctoral degrees in environmental sciences. Today, the faculty includes winners of the prestigious Tyler and Hutchinson awards as well as five professors who are among the most highly cited researchers in their fields.

Departmental field stations and facilities include the Anheuser-Busch Coastal Research Center in Oyster, Virginia, home of the National Science Foundation–sponsored Virginia Coast Reserve Long-Term Ecological Research program, the Virginia Forest Research Facility in nearby Fluvanna County, and the Blandy Experimental Farm near Front Royal, Virginia.

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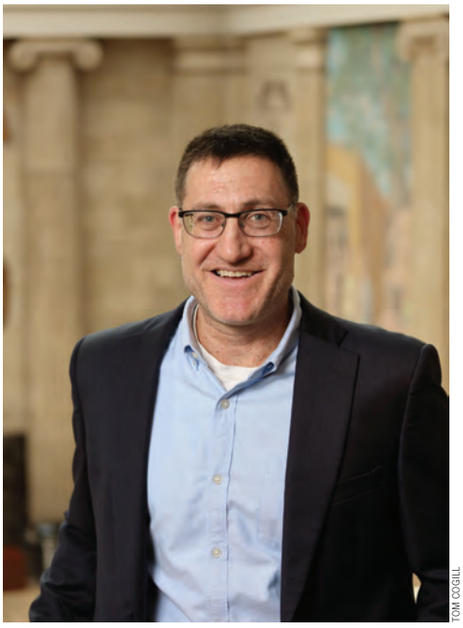
COVER PHOTOGRAPH: Panoramic view of Utqiaġvik, Alaska: Kevin Smith/Alaska Stock

CAROLYN EWERS LEWIS

FROM THE CHAIR



TOM COGILL

Under normal conditions, face-to-face collaboration is critical to teaching and research in environmental sciences. Science is a discipline that depends on knowledge and techniques transmitted from one person to another. And, as the multidisciplinary approach captured by the department's name suggests, research in our field increasingly requires expertise drawn from many disciplines and by colleagues working closely together.

But the conditions this year have been anything but normal. I am very proud of the way the department responded to the pandemic. Our staff transitioned to working virtually, and our faculty members moved their courses online. These efforts took time and considerable patience and ingenuity, yet we all put in late nights because of the importance we place on our responsibilities to our students.

Faculty members also developed safety protocols for our laboratories to help us maintain our research productivity. Although we haven't been able to travel to distant locations, we have been able to conduct fieldwork locally, undertake simulation modeling, and monitor remote data acquired from satellites and other platforms.

I am also proud of the way the department responded to the cries for social justice following the deaths of George Floyd, Breonna Taylor, and others. We have formed a Diversity, Equity, and Inclusion Committee, and its work has led us to create a departmental mission, vision, and values statement that explicitly describes our commitment to high-quality science, integrity, inclusivity, and environmental justice.

We also eliminated the GRE requirement for graduate admission, as the GRE is a poor predictor of a successful research career and a barrier to minority admission. In addition to our current search for a joint faculty position with the School of Data Science, we recently received approval to search for a faculty member specializing in environmental justice issues in Black-dominated communities, as part of the College Race, Justice, and Equity cluster hire.

Although I look forward to the day when we can resume classes in person, meet with colleagues, and travel to conferences, I believe our department did an outstanding job carrying out its mission in a very difficult year. We look forward to better times ahead.

Howie Epstein, Chair

Facing page: Seagrass researchers.

An Epochal Year

Our response to the events of this year underscores our department's commitment to safeguard the health of our students, staff, and faculty as well as to become a more inclusive institution that values environmental justice.

Moving the Department Online

The most visible aspects of our department's activities—our teaching, research, and outreach—would not be possible without the dedication and expertise of our Clark Hall staff, who work diligently behind the scenes in our offices next to the Mural Room. Their importance was underscored this year as they migrated the administration of the department to a virtual platform.

As faculty moved their classes online and established strict distancing and cleaning protocols for laboratories, the department staff, working from home offices and dining room tables, made sure that they had the support they needed. "Like other organizations, we could rely on video calls to replace weekly meetings and use file-sharing programs to collaborate on documents," says **Dave Smith**, the department's associate chair. "But the truth is that many tasks done remotely take more time and considerable ingenuity. Our staff has adjusted magnificently."

MAKING THE REMOTE CONNECTION AS EFFECTIVE AS POSSIBLE

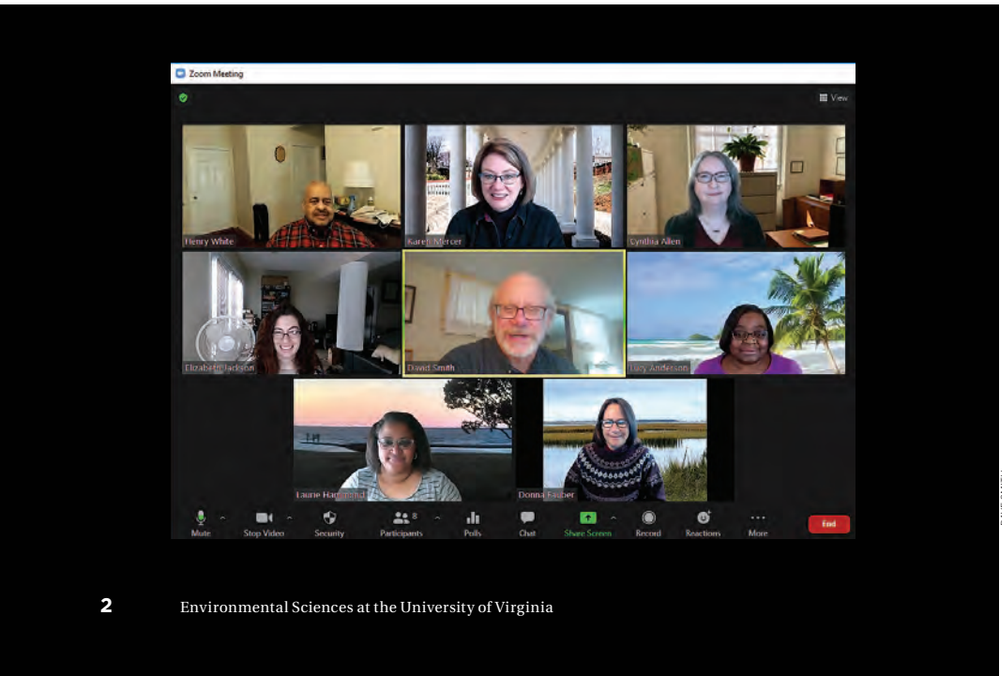
A good example is the kiosk the department installed in the Mural Room in Clark Hall. Our majors, prospective majors, and graduate students often have questions that only staff can answer, but with staff working from home, students on Grounds had no way to contact them. Using a tablet, keyboard, and monitor, we created a system that enabled students to access the staff member who could best answer their questions via a video link. Staff members kept the video conferencing program open on their computers so they could monitor calls. "We wanted to be as responsive to student needs as possible and get them the information they needed when they needed it," Smith says.

The department also had to make sure that students had access to the resources they required for research and coursework. One challenge was ensuring that graduate and undergraduate students working at a distance had virtual access to the department's graphical information systems lab, which is equipped with a dozen high-powered computers. "The computing power of these machines far exceeds what's available on most standard desktops," Smith explains, "and the department has only a limited number of software licenses for its GIS program."

In other words, students working from their dorms or from home could not load the program on their own computers, which in any case would not be powerful enough to run it. In response, the department's computer staff established a connection that enables students with approved access to mirror the screen of the lab computer on their home device.

EXTENDING SYSTEMS ALREADY IN PLACE

Taking the department administration virtual was made easier by a number of measures the department put in place before the pandemic that provided additional resiliency. Like virtually all offices at UVA, our files are backed up on dedicated servers in the University's data center. Having staff take their office computers home with them simplified the process of gaining access to the data from their homes. And over time, Smith has built redundancy into his staffing. "I have several bookkeepers, for instance, so that if someone gets sick or goes on vacation, we can still get the job done," he says. "Having staff with overlapping competencies has turned out to be especially important during the pandemic. If people need to take a break, we can help."



DAVE SMITH

First row, left to right: Henry White, Grants Fiscal Tech Senior; Karen Mercer, Post Award Administrator; Cindy Allen, Academic Program Specialist

Second row, left to right: Elizabeth Jackson, Program Support Coordinator; Dave Smith Associate Chairman; Lucy Anderson, Department Manager

Third row, left to right: Laurie Hammond, State Account Fiscal Tech Senior; Donna Fauber, ABCRC/LTER Administrative Assistant

Not pictured, William Tomanek, Dept. IT Support

Opening Up the Environmental Sciences

The outrage over the deaths of George Floyd, Breonna Taylor, and others caused organizations of all kinds to reexamine their efforts to advance diversity, equity, and inclusion (DEI) and to take concrete steps to better embody the principles of social justice. The department was among these.

Graduate students and faculty members issued a position paper that urged the department to take a more active role consistent with its mission of education, research, and service. In response, department chair Howie Epstein established a diversity, equity, and inclusion committee to assess the department's current efforts and establish long-term goals. "Some of the changes we proposed will have an immediate impact," says Professor **Matt Reidenbach**, who chairs the committee. "Others will take more time, but we believe that we're moving in the right direction."

PARALLEL PATHS TO DIVERSITY

An obvious issue is the lack of diversity in the department, which as Reidenbach notes, reflects the lack of diversity in the environmental sciences as a whole. "We have a pipeline problem," he says. "When you get to the faculty level, the pool of diverse faculty is pretty shallow." In response, the department will be examining its hiring practices to attract the broadest possible range of candidates. This might entail recruiting faculty at the intersection between environmental science and environmental justice—the dean has just approved the department's request to do so—or collaborating with other departments on joint positions.

The department is also taking steps to enlarge the pipeline at its base. At the recommendation of the committee, it is funding efforts to expose minority undergraduates to hands-on research, especially on projects involving environmental justice, and is considering ways to modify the existing undergraduate mentorship program to include more minority students.

One of the first results of the committee's efforts to encourage more graduate student applications from minority students is the elimination of the GRE requirement. "The GREs are a better indicator of students' performance for graduate programs primarily based upon coursework, not those built around research," Reidenbach says. "The GREs don't measure qualities like creativity and motivation that translate into research productivity, scholarly publication impact, and time to graduation."

GREs also raise equity issues. Standardized tests have historically fallen short in representing the achievement and aptitude of minority students, and their costs can present a barrier. Going forward, the department will focus on a holistic assessment of an applicant's personal statement, prior research experience, interviews, and undergraduate record.

INCORPORATING ENVIRONMENTAL JUSTICE

Environmental justice is another area where the committee believes that the department can do more. The department's faculty members have done groundbreaking work on climate change and water and air pollution. However, that research has historically not focused on their disproportional effect on minority communities. The committee is exploring how the department can offer new courses and add environmental justice modules to existing courses, as well as incorporate environmental justice in research.

As Reidenbach acknowledges, progress on DEI can be uncomfortable, but progress is necessary. "It's worth the effort," Reidenbach says. "Not only is pursuing DEI the right thing to do, but having a diverse, equitable, and inclusive community will also enhance our science."

UVA DEPARTMENT OF ENVIRONMENTAL SCIENCES MISSION STATEMENT

The department saw the calls for social justice this year as an opportunity to adopt a mission statement.

OUR MISSION

Our mission is to advance understanding of the environment through interdisciplinary scientific research, education, and servic .

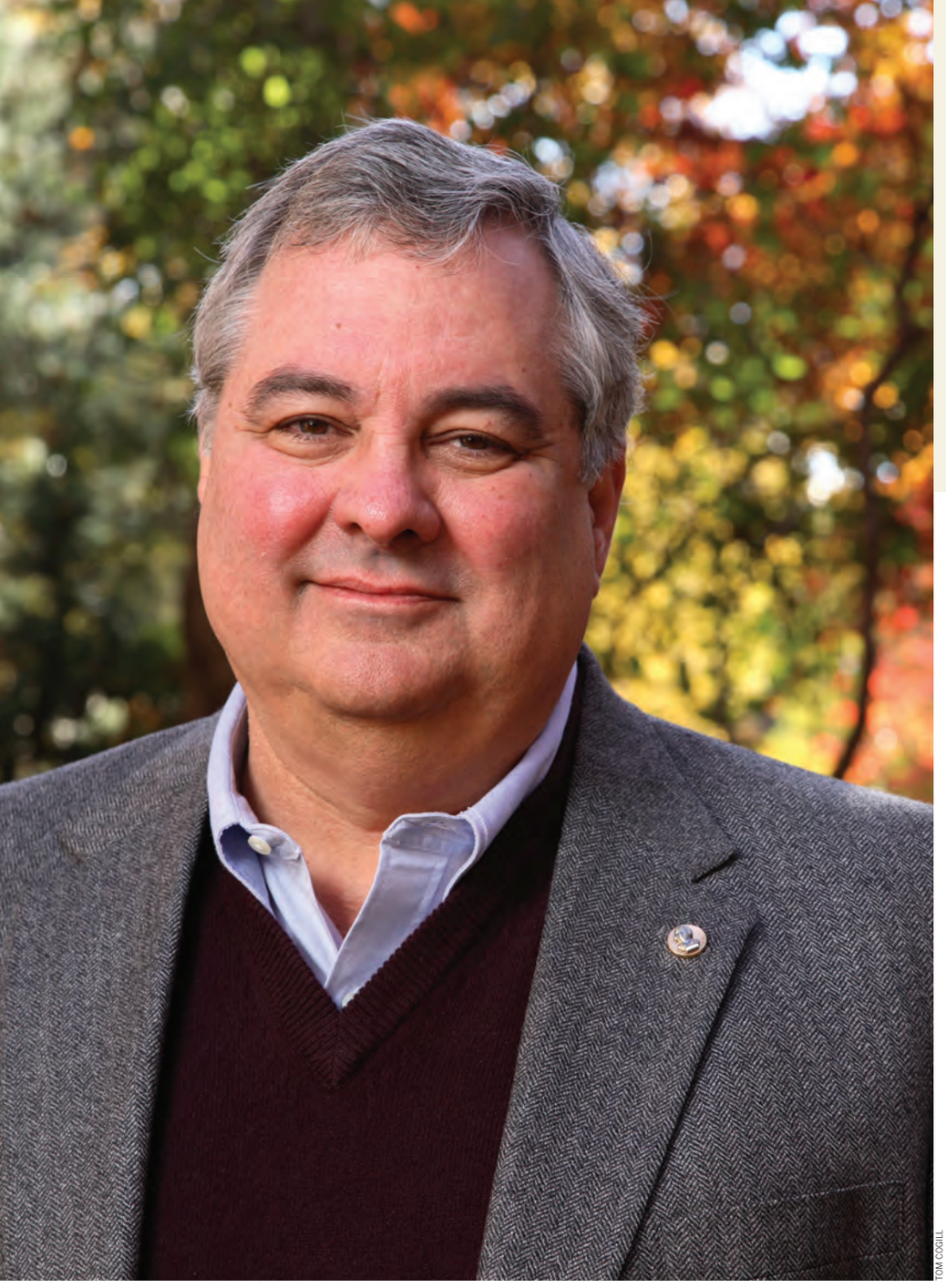
OUR VISION

We work at the forefront of research to discover, integrate, and communicate new knowledge and generate wisdom about environmental systems. We provide outstanding and innovative education and exceptional mentorship. We pursue fundamental, transformative science that provides objective and impactful information for management, policymaking, and environmental justice.

OUR VALUES

Our mission and vision are supported by a commitment to a core set of values that guide what we do as a community of scholars:

- **Integrity:** Maintain the highest standards of scientific, academic, and professional ethics
- **Diversity and Inclusivity:** Strengthen and foster a community that supports people from diverse backgrounds and empowers individuals for who they are
- **Freedom of Inquiry:** Promote open exploration of science that is accepting of respectful, constructive criticism and unbound by external pressures
- **Societal Impact:** Conduct science that makes a positive impact on the world
- **Collegiality:** Facilitate collaboration, teamwork, and support for each other's success
- **Community Engagement:** Respectfully and cooperatively engage with the communities where we live, study, and work



TOM COGILL

Celebrating Hank Shugart

A CAREER INSPIRED BY CURIOSITY

The last half century has seen a remarkable flowering of the environmental sciences as the pace and scope of discovery increased dramatically. Hank Shugart was not only a witness to this era of transformational change but also a leader.

When Professor **Hank Shugart** talks about his career, he adopts a tone of detached bemusement, as if all he has accomplished during his life was the work of some other person who enjoyed the exceptional good fortune of being able to indulge his curiosity. Characteristically, he downplays the years of juggling multiple projects, the sharpness of his intellect, and the wide-ranging quality of that curiosity. In fact, in Hank's life, if one thing led to another, it was because he lined them up and connected them.

Hank traces his career as an academic to his earlier incarnation as "the boy naturalist," a 12-year-old in 1950s Arkansas who liked nothing better than to spend his mornings on a Ouachita River levee spotting birds. He attracted the attention of Douglas James, a professor at the University of Arkansas, when he sent him a specimen of a snow bunting that had wandered hundreds of miles south of its normal range. James, on his way to becoming the region's foremost ornithologist, asked Hank to collect birds for him. Hank secured a collector's license and was soon sending specimens to museums across the East. "Every year, I got a letter from the federal government addressed to Dr. Shugart asking me to account for the birds I collected," he says. "At 13 or 14, I thought this was pretty neat."

While clearly his choice of career was not determined by the address on an envelope, his childhood experiences do hint at the direction that career took. As a teenager, Hank already displayed an interest in measuring nature on larger scales. With James' encouragement, he started conducting community-level studies, extrapolating the number of different species in an area from limited sightings. He soon started publishing his results in *Audubon Field Notes*.

MAKING THE MOST OF HIS OPPORTUNITIES

It is undoubtedly true, nonetheless, that for a person of Hank's talents, his timing was excellent. When Hank enrolled in the doctoral program at the University of Georgia in the late 1960s, his interest in bird population

Since my departure from the department and Charlottesville, I've become a professor myself. And every rung of the ladder I climb, Hank is there, cheering me on.

—Wendy McIntyre (PhD '01)
Hedco Chair for Environmental Studies
University of Redlands

Hank really opened my eyes and brought me to a world of ecology research that's both deep and broad. His wisdom, kindness, generosity, and humor are deeply influencing me as I develop as a scientist.

—Bin Wang (PhD '17)
Postdoc, Ecological Modeler
University of California, Irvine

One of the favorite expressions I took from Hank was, "Sometimes you have to turn your mother's picture to the wall." It helps me remember that science is a messy process and that perfection is not always attainable.

—Gordon Bonan (PhD '88)
Senior Scientist, Climate and Global Dynamics
National Center for Atmospheric Research

and community studies had morphed into a fascination with applying statistical methods to natural systems. Coincidentally, mainframe computing had emerged as a viable tool for this type of research. Hank had the right skillset and perspective to make the most of it.

"There were people who could run computers and solve differential equations, and people who knew about birds, but they didn't mix," he recalls. "I could do both." In 1971, as a newly minted PhD, he took a job with Oak Ridge National Laboratory. At that time, Oak Ridge had one of the most powerful computers on Earth.

The 1970s also saw ecology gain prominence as a field of study and the boundaries between the natural sciences become more fluid. This trend ideally suited Hank's wide-ranging habit of mind.

Hank started making the type of intellectual connections that defined his career. In essence, the statistical analysis he developed to predict a particular bird's appearance in a given habitat led him to take a closer look at the process of vegetation sampling, which in turn led to vegetation modeling and, in particular, a new approach to forest modeling. "It was a natural evolution for me," he says. "The early 1970s were times of dramatic social and intellectual change, which gave me the leeway to follow my inclinations."

LOOKING DOWN AT THE EARTH

Ten years later, by the time he moved from Oak Ridge to UVA, Hank had validated his forest models by running them backward to test their predictive value under past climate conditions. Running them forward put him at the forefront of studies of climate change and carbon sequestration. In 1983, he worked with colleagues in Sweden to produce the first report on climate change effects on global forests and agriculture, the forerunner of the Intergovernmental Panel on Climate Change reports.

In the late 1990s, Al Gore, then a senator from Tennessee, had the idea of releasing 30 years of images and measurements from top-secret spy satellite missions as a way of helping the scientific community fill out its knowledge of the impact of climate change on features like vegetation and sea ice. Although Hank ascribes his selection to the committee declassifying the data "to some process I couldn't fathom," it is clear that his background made him the ideal person to determine the information most relevant to forests.

Here again, one thing led to another, because Hank makes his own luck. He spent an increasing amount of time advising NASA on sensing devices for the agency's Earth satellites, which in turn led to his appointment to a panel advising the European Space Agency on its Biomass mission, set to launch in 2022. It will be able to determine the amount of biomass and carbon stored in forests, key information for more precisely quantifying the global carbon cycle.

FULFILLING HIS IMAGE OF THE IDEAL PROFESSOR-SCIENTIST

Over the course of his career, Hank has published hundreds of articles, written or edited over a score of books, including *A Theory of Forest Dynamics*, a book that defined forest modeling. A volume that shows another side of his synthetic powers is *Foundations of the Earth: Global Ecological Change and the Book of Job*, which he characterizes as "a strange entanglement of theology and big-picture ecology." Hank uses the catalog of questions in Job's Whirlwind Speech to address issues such as animal domestication, sea-level rise, and biodiversity. The book was praised by theologians as well as by environmental scientists.

Hank likes writing books, but writing them also accords with the vision of the ideal academic he formed as a teenager. "I was a kid from the swamps who had never been around professors or any of those kinds of folks, but I had this mental stereotype of what the ideal professor-scientist is supposed to be like," he says. "I heard professors write books, do research, and have students."

This last part has always been very important for Hank. Altogether, he has advised 56 doctoral and 24 masters students and taught thousands of graduate and undergraduate students over several generations. "It's been a real source of gratification," he says.

AND HE TELLS A GOOD STORY

By any metric, Hank Shugart has made his mark. His accomplishments as a teacher, writer, and researcher have been widely acknowledged. He is a Fellow of the America Geophysical Union, a Foreign Member of the Russian Academy of Science, and has been designated as a HighlyCited™ Scientist in the area of Ecology/Environment by the Institute of Scientific Information, the compilers of the Science Citation Index, since March 2003.

But there is one source of his success that is only hinted at by research productivity metrics. Besides the image of the ideal professor-scientist, Hank also took from his childhood in El Dorado, Arkansas—which he locates on the border between "the marshes and piney woods"— his ability to turn a phrase and tell a good story. People find his warmth and authenticity enormously compelling. Certainly, these qualities have opened opportunities for him and enabled him to move through an ever-widening universe of projects. But it is also what makes people want to work with him, and it is why they value and remember, decades later, his casual wisdom and his friendship as well as his many achievements.

The arrival of new faculty, postdoctoral researchers, and senior scientists ensures that the department benefits from new ideas and new perspectives.

New People Bring New Perspectives

Linking Thunderstorms to Climate Change

Life in the tropics is punctuated by frequent thunderstorms and torrential downpours. While these storms are transitory, local phenomena, collectively they are so powerful that they influence the general circulation of the atmosphere and play a role in regulating the temperature and energy budget of the Earth. Because of their importance, understanding these deep convection events, which include tropical cyclones, will be critical to predicting the course of climate change as the Earth warms.

But as Assistant Professor **Kathleen Schiro** notes, our ability to connect these thunderstorms to larger-scale atmospheric conditions and to account for them in global climate change models is hamstrung by our failure to understand the basic physics that drives them. An atmospheric scientist, Schiro is working to create linkages among local, meso-, and global scales.

STUDYING DEEP CONVECTION ACROSS DIFFERENT SCALES

Schiro is tackling the problem from multiple perspectives. She's working to produce a basic understanding of how deep convective systems in the tropics are formed. One area she's investigating is the section of the troposphere that lies 1 to 3 kilometers above the Earth's surface. "In the Amazon, we found that when moisture is readily available in this region, convection is kicked off more easily than if it is dry," she says. She and a UVA undergraduate are tracking similarities in the way convection develops in a place like Charlottesville during the summer. Schiro is planning to do fieldwork locally and as part of larger field campaigns to profile the atmosphere and study its evolution preceding convection.

She is also studying the interaction of these local systems with the larger structure of the atmosphere and how these interactions may change in a warmer world. "We have reason to suspect that with global warming, convection might become structurally different—possibly more organized—and we might see bigger, more intense systems," she says. "This in turn may further modify the energy budget of the Earth by affecting the large-scale atmospheric circulation and redistributing clouds."

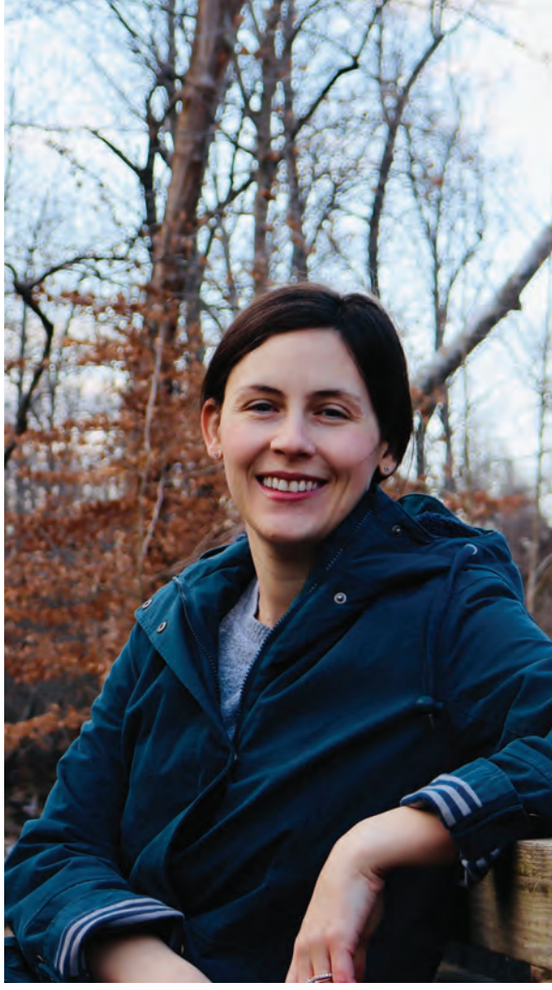
Ultimately, Schiro's goal is to use the knowledge she gains from these investigations to reduce the uncertainty in future hydroclimatological changes predicted by the global climate models used in publications like the Intergovernmental Panel on Climate Change (IPCC) report. "In recent work, I've been looking at just how sensitive the climate is to the representation of small-scale deep convection in these models," she says. Much of her work entails suggesting improvements to how deep convection is represented in climate models using field campaign and satellite data. "Because the physics of deep convection is unknown, we don't even fully understand why our current parameterizations are not doing a great job representing these systems in climate models," she says.

THE BENEFITS OF AN INTERDISCIPLINARY DEPARTMENT

Schiro arrived at UVA in 2020. One reason she chose to come is that the research being conducted in the department, especially in the areas of atmospheric dynamics, land-atmosphere interactions, and hydrology, is highly complementary to her research program. "Studying hydroclimatological changes is quite interdisciplinary," she says. "I'm excited to collaborate with my colleagues, combine our expertise, and work toward a common goal."

Other reasons Schiro chose the department are the students and the opportunities the department provides for them. "The students are excellent, and the department is highly supportive of undergraduate student research," she says, adding that providing high-quality research experiences to undergraduates is an important step towards diversifying the environmental sciences.

But most of all Schiro appreciates the interdisciplinary nature of the department because it exposes her to discoveries and insights far from her field. "Although I'm an atmospheric scientist, there are just so many different things about the natural world that I would like to know," she says. "This is a great place to gain new perspectives and maintain a big-picture view of the Earth and all of its different components."



Above left: New faculty member Kathleen Schiro studies thunderstorms to make climate models more accurate.

Above right: Postdoc Carolyn Ewers Lewis is studying blue carbon processes across ecosystems.

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EMILY NEAL

Taking Her Training to the Next Level

For newly minted PhDs, doing a postdoc is an opportunity to gain new technical and research skills, build on their dissertation research or gain expertise in a complementary field, and expand their academic network. As **Carolyn Ewers Lewis**, a postdoc in Professor **Karen McGlathery**'s lab, explains, "It's a steppingstone from being a grad student to whatever you want your career to look like. It's a time to fine-tune your skills and develop the expertise you want to carry into the rest of your career."

For faculty members, having a trained researcher in their lab helps expand research capacity, allowing them to take on new projects that add to the lab's productivity. McGlathery has a lot on her plate. She is principal investigator for the NSF-funded Virginia Coast Reserve Long-Term Ecological Research (LTER) Project on Virginia's Eastern shore and the director of UVA's Environmental Resilience Institute. Having Ewers Lewis on her team is a plus. "Carolyn brings deep knowledge and a wealth of experience to the LTER," McGlathery says. "It's tremendous to have a post-doc to brainstorm with about project design and data analysis."

The postdoc position in McGlathery's lab is a great fit for Ewers Lewis as well. Both she and McGlathery study blue carbon, the organic carbon sequestered by coastal ecosystems—in particular, seagrass meadows and salt marshes—thus mitigating the effects of climate change. As Ewers Lewis points out, this is not always a straightforward process. Her research aims to close gaps in our knowledge by improving our understanding of how these ecosystems help lock away carbon for long-term climate benefits.

One of those gaps is the fate of seagrass wrack, the leaves sloughed off annually by these aquatic plants. Seagrass absorbs carbon as it grows, but decaying wrack releases that carbon. Ewers Lewis is trying to determine if this debris is trapped by nearby salt marshes and incorporated into the anoxic sediment at their base, in which case its carbon would remain sequestered. She is examining salt marshes to determine how much of the carbon in their sediments can be traced to local seagrass beds. "Normally, we look at carbon sequestration from the perspective of a single ecosystem," she says. "I'm looking at the way connectivity between ecosystems may enhance blue carbon services."

Although the project fits well into the LTER's long-term research plan, McGlathery and Ewers Lewis designed the study together to fit their shared interests. Ewers Lewis recognizes this as a benefit of working with McGlathery and the LTER. "The broad concept of the study was written into the LTER proposal, but that left a lot of flexibility for Karen and me to hash out ideas and come up with a project that we are both really passionate about," Ewers Lewis says.

In addition to enabling her to expand her research, the postdoc is giving Ewers Lewis the opportunity to learn from McGlathery how to become a better mentor, something she will do when she has a lab of her own. "Karen is really good about maintaining relationships with students and helping them overcome the challenges associated with doing research," Ewers Lewis says. "She has carried this further by giving me the opportunity to mentor students directly, and in turn has mentored me through that process," an experience Ewers Lewis says she is grateful for.

More Ambitious Approaches to Research

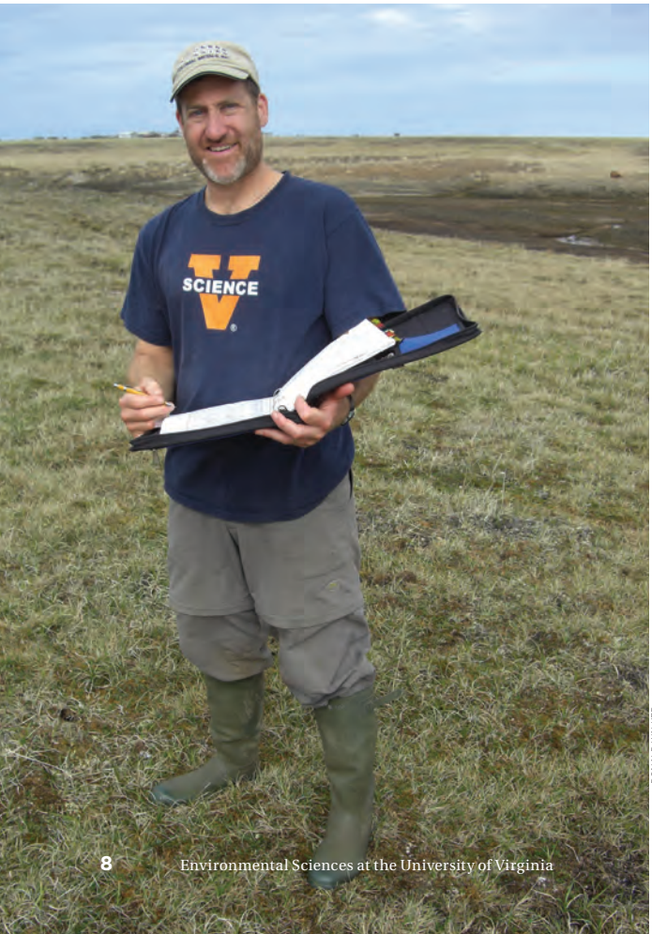
A department's stature is increasingly influenced by its ability to organize and secure large, multidisciplinary grants. The department's $3 million National Science Foundation (NSF) grant, through its Navigating the New Arctic initiative, is a significant step in elevating our standing.

Joining Forces with Arctic Communities Confronting Global Warming

The Arctic is warming faster than the rest of the planet, posing a series of unique threats for Arctic communities that rest on permafrost, or permanently frozen ground. In few other places is the built environment so closely intertwined with the natural one. Because the top layer of permafrost has a high proportion of ice, heat from any source—from housing and infrastructure or warmer weather—can dramatically upset that relationship. These challenges are even more pressing in Arctic coastal communities, where dwindling sea ice and rising sea levels expose them to coastal erosion and flooding.

Utqiaġvik, the northernmost municipality in the U.S. Arctic, epitomizes this dilemma. The built infrastructure of this city of 4,000—including water and electrical utilities, sanitation and wastewater treatment, a road network, and a variety of single-and multistory buildings—rests entirely on permafrost. And the community, formerly known as Barrow, is located on the edge of the Chukchi Sea.

"If they are to adjust to a rapidly changing climate, Arctic communities like Utqiaġvik. must have detailed information about how their natural and built environments interact and how climate change will alter these interactions," says Professor **Howie Epstein**. "No one has really laid out the baseline of information they need to develop strategies that can increase their resilience."



DONALD WALKER

BUILDING ON UVA'S ESTABLISHED STRENGTHS IN ARCTIC RESEARCH

Although Charlottesville is a long way from the Arctic Circle, UVA has a number of researchers who are well positioned to address these issues. Over time, they have joined to form the Arctic Research Center. In addition to Epstein, an Arctic terrestrial plant ecologist, they include landscape architecture assistant professor Leena Cho and architecture associate professor Matthew Jull. Cho and Jull are co-founders of the UVA-based Arctic Design Group, which has been carrying out research on the design of the built environment in the north since 2012.

This year, the National Science Foundation (NSF), through its Navigating the New Arctic initiative, awarded the UVA Arctic Research Center a five-year, $3 million grant to increase the resiliency of Arctic communities facing climate change. Epstein is the principal investigator on the project, which will be centered in Utqiaġvik. In addition to Jull and Cho, the UVA team includes Luis Felipe Rosado Murillo, an associate researcher in UVA's School of Data Science; Caitlin Wylie, an assistant professor of science, technology and society in the School of Engineering and Applied Science; and Claire Griffin, a postdoc in Environmental Sciences.

It is a joint project, with many additional collaborators. A series of community organizations—the Taġiuġmiullu Nunamiullu Housing Authority, the North Slope Borough planning department, Ukpeaġvik Iñupiat Corporation (UIC), and TRIBN, an Iñupiat-owned consulting business—are part of the group. They are joined by experts from the Cold Climate Housing Research Center and the U.S. Army's Cold Regions Research and Engineering Laboratory.

AN INNOVATIVE RESEARCH AGENDA

The foundation of the study will be data gathered from two extensive sensor networks the team will put in place. The first, a terrestrial network, will be deployed to understand key questions about how

buildings influence micro-meteorological conditions, measured on scales ranging from a single building to an entire city block. The second, an aquatic network, will address how infrastructure affects the hydrology and geochemistry of surface waters, again on a range of scales.

The UVA researchers and their local collaborators will jointly design these sensor networks, attempting to maximize their value for the community as well as for the scientists. “The NSF and other funding agencies have been emphasizing the co-production of knowledge as the route to better, more actionable science,” Epstein says. “Because we’re looking at the built and natural environments together, this kind of partnership is the logical extension of our research goals.”

Jull and Cho will work to transform the data into a series of design parameters and best practices based on the sensor data. In doing so, they will consider such complex issues as how changes in weather patterns and snow and ice cover might affect architectural and urban design. Here again, the project will depend on local partners in Utqiaġvik to ensure that design guidelines reflect cultural practices. “The absence of an Arctic-specific design practice has compromised living conditions for native peoples for decades,” Epstein says. “Housing can be poorly adapted for the environment when it is unrelated to local traditions and the changing climate.”

Murillo plans to organize a community data stewardship group to work with the massive amount of data being collected, to best guide all aspects of data visualization, utilization, and management.

Epstein believes the final goal of the study is one of its most innovative objectives. Wylie is a social scientist who studies how people work together to produce knowledge. In this case, she will be leading the effort to understand the dynamics of co-production during the project and identify ways their collaboration can be more effective. “Not only are we going to produce knowledge together,” Epstein says, “we’re going to study how we do it and look at what is effective and what is not. I think that is really appealing.”

Left: Howie Epstein's new research project breaks new ground by focusing on the intersection of the natural and built environments and teaming up with local collaborators.

Right: Claire Griffin, a postdoc, will be managing the project’s aquatic sensor network.

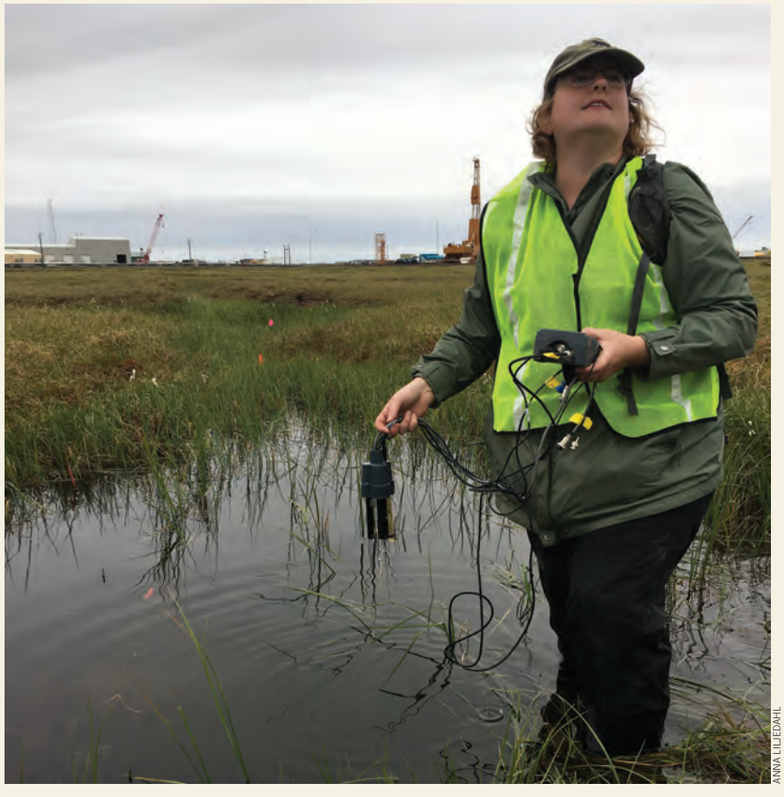
At the Intersection of Infrastructure and Hydrology

When the Arctic Research Center’s new NSF-funded project, Understanding the Changing Natural-Built Landscape in an Arctic Community, launches in 2021, **Claire Griffin** will have a leading role. A postdoc whose position was originally funded by UVA’s Environmental Resilience Institute, Griffin will be responsible for setting up and managing the project’s aquatic sensor network. In many ways, it is the perfect job for her. It is the next step in a decade-long journey that started when she was an undergraduate researching carbon cycling in Siberia. “You spend a month in the Siberian Arctic as a young person, and it will change your life,” Griffin says. As proof, she notes that six of the 10 students on that project went on to earn their PhDs in related fields.

Griffin’s specialty is aquatic biogeochemistry and hydrology, and she has been using remote sensing from satellites to learn more about the way rivers in the Arctic respond to climate change. Recently, her interests have expanded to include how local communities are being affected by a warming climate. “We tend to think of the Arctic as being sparsely populated and wild, with the few people living there following a nomadic existence,” she says. “This is no longer the case.” People, especially indigenous peoples, have always been a part of the Arctic landscape, and modern development is only increasing interactions between humans and the environment.

Griffin’s expertise will be critical because arctic tundra is largely characterized by wetlands, bogs, and ponds. Although there is not much rain, the water that falls tends to pool up because the landscape is flat and permafrost prevents water from seeping deep into the ground. Roads and other infrastructure disturb the region’s characteristic hydrology, creating more opportunities for ponds to form. Because the water retains heat, ponds can melt the top layer of permafrost, which adds yet more water to the landscape. Griffin will be collecting the data needed to understand these relationships.

She is also excited about the central role that local community groups will play in the project. “This is something that the NSF has been trying to encourage,“ she says. “We are really at the leading edge of that.”



ANNA LILJEDAHL

Education During the Pandemic

Each of our faculty members made an individual decision about the best way to teach students. Regardless of their approach, teaching during a pandemic requires hard work and creativity.

Fundamentals of Ecology: The Directors' Cut

When the pandemic struck, the challenge facing **Kelcy Kent** and her fellow Fundamentals of Ecology teaching assistants (TAs) was daunting: Break down an essential course for majors that features fieldwork, experimental design, and scientific writing and reconfigure it for distance learning. They succeeded by channeling their inner Martin Scorcese, filming themselves demonstrating sampling techniques in the field, creating step-by-step tutorials on using Excel for data analysis, and recording lectures. "Everyone was really motivated," Kent says. "We all love ecology and did our best to overcome the disadvantages caused by the pandemic."

The course is overseen by a professor—this year it was **Mike Pace**—and organized around three weekly lectures that he or she gives and a four-hour weekly section meeting led by TAs.The TAs follow an established course manual in planning their section meetings, although each TA has some creative leeway in presenting the material. The manual also specifies the kinds of activities TAs will lead, including field trips, data analysis instruction, and peer editing sessions for scientific writing. "Having a manual to work from was a really big advantage," Kent says. "Equally important was working with a resourceful and dedicated group of experienced TAs, who helped guide the new TAs and contributed great ideas on how to reformat this class to better suit online learning."

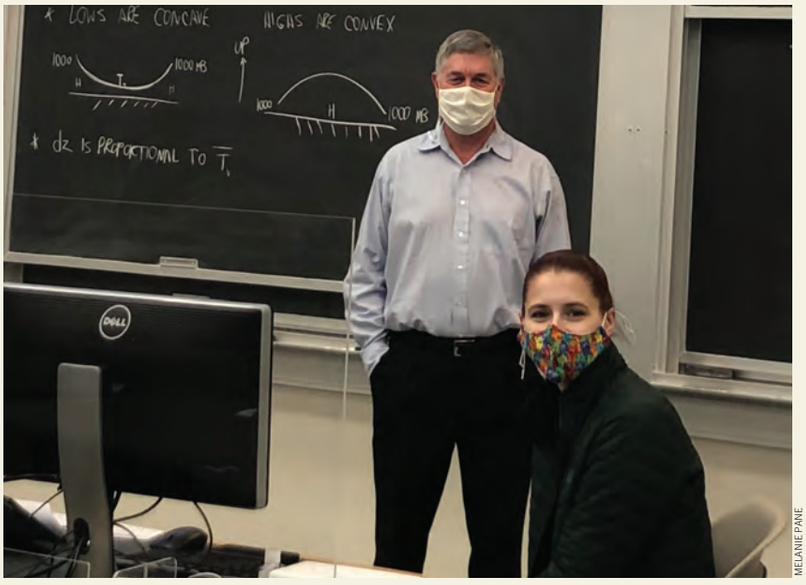
STORYBOARDING THE COURSE

Before doing anything, Kent and her colleagues sat down with the manual and decided which segments they could shift online.They then discussed how they could best translate each one for maximum virtual impact. In essence, they created the kind of storyboard that directors use to film a movie. For instance, for section meetings where information is delivered through lectures, they divided the material into 10- to 15-minute videos. "We thought it would be easier to keep students' attention if we made the material more digestible," she says.

They used the same methodical approach for documenting terrestrial and aquatic sampling techniques. "Before we went to the site, we planned out the videos we wanted to make," Kent says. "We tried to

Facing page: A screen capture of Kelcy Kent, part of an instructional video Kent and her fellow TAs made for Fundamentals of Ecology.

Below: Bob Davis and his TA, Megan McAuliffe, made simultaneous remote and in-person teaching work.

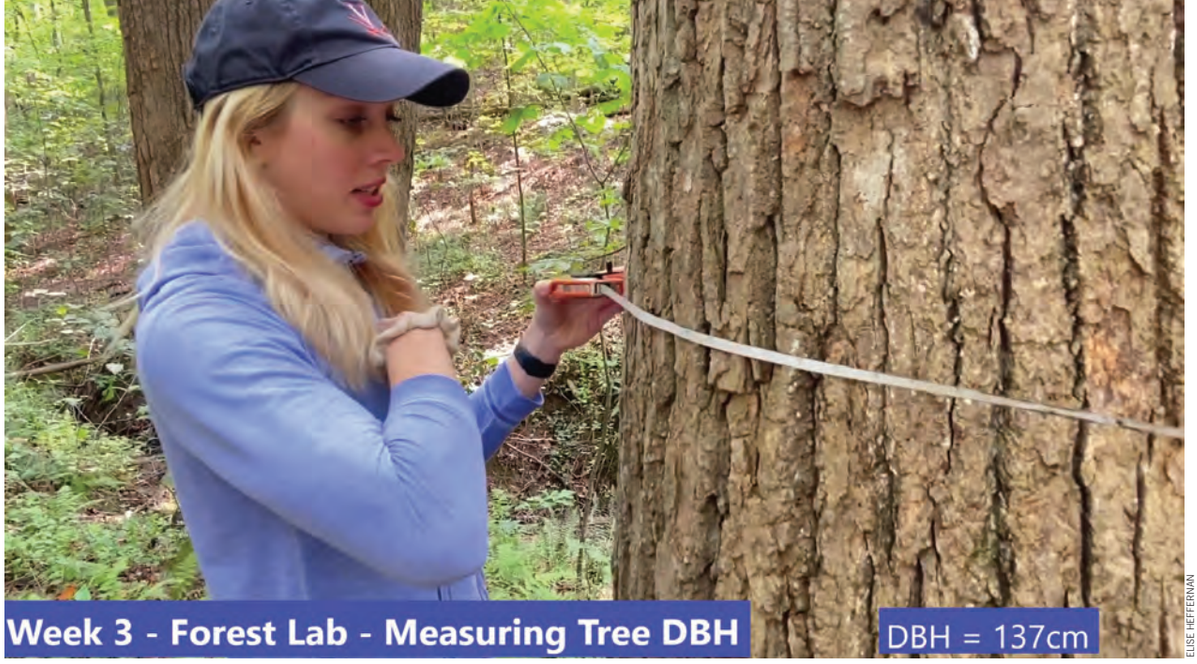


MELANIE PANE

Serving Two Audiences

For Professor **Bob Davis**, the decision to teach EVSC 3300, Atmosphere and Weather, in person despite the pandemic was obvious. "We have hundreds of years of history that demonstrate that bringing people physically together is the best way to instruct them," he says. "Online learning cannot reproduce that sense of immediacy."

As it turned out, a significant portion of his students agreed. Before the semester began, Davis polled students to see if they would feel comfortable attending classes in Clark Hall. About 30 said they would at least some of the time. With many students attending the University from home and



ELISE HEFFERNAN

see the course from the perspective of the students and include what they would need to know."

Kent admits that filming involved some trial and error, bloopers and retakes. The TAs thought initially that a GoPro would be the ideal camera to take into the field. Although it proved adequate for aquatic ecology, it was an utter failure for terrestrial ecology. The TAs discovered that its microphone seemed more attuned to crunching leaves than to the human voice.

Although Kent and her colleagues could use videos to familiarize students with sampling techniques, students still had no way to gather their own data. To bridge this gap, the TAs carefully curated a dataset based on sampling results from previous years. They included anomalies, which gave them the opportunity to discuss with students the possible sources of these abnormal readings. Otherwise, it was up to the students to clean up the data, average it, and reformat it for analysis. The TAs prepared students for data analysis by creating a series of Excel tutorials that led them through the process. "We did our best to replicate the entire experience," Kent says. "The students did everything but get their hands dirty."

CREATING A FILM LIBRARY

Once the pandemic is over and students in Fundamentals in Ecology are taking the course in person, all the videos and tutorials that the TAs took will still be valuable. "We can use them as a back-up for students who have to miss classes," Kent says. "We can also use them to supplement in-person instruction. Students might review a sampling technique video before or after going to the field. In effect, they can use our work to reinforce what they learn."

The students in Fundamentals of Ecology were not the only ones who gained something from the exercise. For Kent, it was an opportunity to review her teaching methods and hone her presentation skills. "Overall," she says, "it was hard work, but it was also a lot of fun, and a great opportunity for us to learn as instructors, too."

access to University buildings restricted, Davis felt safe going forward with his plans.

"We observed all the safety precautions," says Davis, whose research lies at the intersection of atmospheric temperature and moisture and human health. Everyone in the classroom wears a mask, social distancing is maintained in teaching, and hand sanitizer is readily available. His TA, **Megan McAuliffe**, sits behind a plexiglass partition.

DOING DUAL DUTY

McAuliffe's role is pivotal. Davis is not only teaching in person: He's teaching remotely at the same time. Most professors teaching remotely conduct classes from their offices. McAuliffe ensures that the portion of Davis' students taking the class from their homes or dorms get as much of the classroom experience as possible.

"Megan is my director, producer, and camera person all rolled into one," Davis says. "She runs the show while I'm doing the teaching. She's been terrific."

Before each class, Davis and McAuliffe map out the session, outlining the sequence of topics he will follow and choosing the slides and websites he will use. McAuliffe tracks his movements with a camera and makes sure that students see the same information on their computer screens that is projected in the classroom.

"It's really challenging," Davis says, "but I have the advantage of having done theater all my life. I know what it means to hit your marks."

In-person attendance averages about 20 percent of the course's enrollment, and Davis reports that students appreciate the opportunity not only to be in the same room as their professor, but also to be learning from other students. Davis stresses, though, that his decision to hold in-person classes is a personal one. "I feel I have a responsibility to offer an in-person experience to students who want it," Davis says. "This just works for me."

Awards, Appointments, and Publications

UNDERGRADUATE STUDENTS

The department recognizes fourth-year students who have done outstanding work in specific environmental sciences. This year, the Michael Garstang Atmospheric Sciences Award went to **Carlee H. Kleppin** and the Mahlon G. Kelly Prize in ecology to **Sophia M. Rosenberg**. The department presented its Interdisciplinary Award to **Julia A. Stanganelli**. It is given to the undergraduate major who has excelled in research across the environmental sciences.

Jacob H. Bushey was selected to receive the Hart Family Award for Undergraduate Research in Environmental Sciences. It provides funds to assist full-time environmental sciences majors conducting a supervised research project.

Samuel Mogen received the Wallace-Poole Prize, awarded each year to the graduating student majoring in environmental sciences who has at least a 3.8 GPA and who is judged the most outstanding student in the class.

The Bloomer Scholarship, which provides $1,800 toward tuition, is given to an outstanding undergraduate environmental sciences major with a focus on geology. This year's winner was **Jacob S. Slawson**.

To be chosen for the College's distinguished majors program, students must achieve an overall GPA of 3.4 or above. This year, the department selected **Asad E. Ali**, **Luciana Codella**, **Margaret E. Houck**, **Carlee H. Kleppin**, **Benjamin Masters**, **Samuel Mogen**, **Sophia M. Rosenberg**, **Jacob W. Smith**, **Julia A. Stanganelli**, **Cristobal P. Yanez Tandeciarz**, and **Yulan Yu** as distinguished majors.

Selina Cheng was this year's recipient of the Trout Unlimited Award. Established by the Thomas Jefferson Chapter of Trout Unlimited, this award is presented for "significant contributions to research concerning cold water fisheries or related ecosystems."

Jennifer M. Vance received the department's Environmental Sciences Organization Award, which is given to a member of the department who has been particularly helpful to undergraduate majors.

GRADUATE STUDENTS

Stephanie A. Roe was the winner of the Maury Environmental Sciences Prize, the department's premier award. Established by Dr. F. Gordon Tice in 1992, the award recognizes and honors outstanding undergraduate or graduate students for their contributions to environmental sciences, their ability to communicate their findings, and their efforts to promot a better understanding of the environment.

The department offers a series of awards honoring exceptional graduate students in environmental sciences specialties. **Kinsey N. Tedford** earned the Graduate Award in Ecology, **Ruoyu Zhang** secured the Graduate Award in Hydrology, and **Morgan M. Shelby** received the Ellison-Edmundson Award in Interdisciplinary Studies.

Jessica A. Flester was this year's winner of the Joseph K. Roberts Award, given to a student who presents the most meritorious research paper at a national meeting.

Sara Hogan received the Thomas Jefferson Conservation Award, which supports basic research related to the conservation of the Earth's resources.

Hannah Mast won the Michael Garstang Award, which supports graduate student research in interdisciplinary atmospheric sciences.

Amelie Berger received the Jay Zieman Research Publication Award, named after the late Jay Zieman, long-time chair of the department.

This year, **Laura E. Barry** won the Moore Research Award. Based on merit, this award was initiated to help sponsor the dissertation and thesis work of environmental sciences graduate students.

The Exploratory Research Awards, also based on merit, were initiated to help selected students conduct preliminary research leading towards the development of a thesis or dissertation proposal. The recipients this year were **Tyler E. Barnes**, **Zoe A. Bergman**, **Kelsey S. Huelsman**, **Andrew D. Jablonski**, **Marion McKenzie**, **Kelsey L. Schoenemann**, and **Emily Spindler**.

Kelsey S. Huelsman won the Graduate Student Association Award, which recognizes a member of the department who has been particularly helpful to the graduate student body.

Alexandra M. Parisien won the Fred Holmsley Moore Teaching Award, bestowed on graduate teaching assistants distinguished by their ability to instill excitement, wonder, and confidence in students. An endowment set up by Fred H. Moore funds this award, along with matching donations from Mobil Oil Company.

FACULTY

Lawrence Band, the Ernest H. Ern Professor, is an associate editor of *Hydrological Processes*. He represents the University at the Consortium of Universities for the Advancement of Hydrological Science, Inc. (CUAHSI) and is a member of the CUAHSI Executive Director Review Committee. At the University, he is a member of the Promotion and Tenure Committee in the College and Graduate School of Arts & Sciences as well as the Dean's Research Advisory Committee. He is also a member of the Faculty Steering Committee for the Environmental Resilience Institute and was a co-organizer of its Water Futures Initiative.

Peter Berg arranged two sessions on underwater flux measurements at the Association for the Sciences of Limnology and Oceanography Ocean Science Meeting.

Linda Blum is a board member of the Chesapeake Bay Sentinel Site Cooperative and a member of the Surface Elevation Table Working Group for the Mid-Atlantic Region, both sponsored by the National Oceanic and Atmospheric Administration. She was chair of the Mentoring Subcommittee for the Coastal and Estuarine Research Federation's (CERF's) 2019 Conference and is chair of the Conference Art Committee for CERF2021.

David Carr is an associate editor of the *American Journal of Botany* and is a member of the Board of Directors of the Foundation of the State Arboretum.

Max Castorani was a judge for student presentations at meetings of the Coastal and Estuarine Research Federation and the Western Society of Naturalists.

Robert Davis chairs the Assembly Group of the Processions Committee at the University.

Stephan De Wekker is the editor of the *Journal of Applied Meteorology and Climatology* as well as an associate editor of *Atmosphere*. He is active in a number of scientific initiatives and organizations. Professor De Wekker is a member of the steering committee for the Transport and Exchange over Mountains–Programme and Experiment (TEAM-X) and was a member of the organizing committee for its summer 2019 workshop. For the American Meteorological Society (AMS), he serves on the Scientific and echnological Activities Commission on Agricultural and Forest Meteorology and represents AMS at the Council for Agricultural Science and Technology. He is also a member of the organizing committee for the International Conference on Alpine Meteorology, the NCAR Observing Facilities Assessment Panel, and the Mountain Terrain Atmospheric Modeling and Observations Program. At the University, Professor De Wekker is a member of the College and Graduate School of Arts & Sciences Promotion and Tenure Committee and chair of the Faculty Senate Nominating Committee. He also represents the UVA at the University Corporation for Atmospheric Research.

Scott Doney, the Joe D. and Helen J. Kingston Professor in Environmental Change, was named a Web of Science Highly Cited Researcher in Environment and Ecology as well as Geosciences. He was named in two areas: geosciences and environmental/ecology. He also serves as secretary of the Atmospheric and Hydrospheric Sciences Section at the American Association for the Advancement of Science and as a member of the Climate Observing System Council at the National Oceanographic and Atmospheric Administration (NOAA). He is an author on the North American Carbon Program Science Implementation Plan Processes and Attribution team and a member of the Redfield Lifetime Achievement ward Subcommittee of the Association for the Sciences of Limnology and Oceanography.

In addition, Professor Doney participates in a number of interagency groups. He is a member of the Ocean Carbon Biogeochemistry Scientific teering Committee (NSF and NOAA), the U.S. Biogeochemical Argo Subcommittee (Ocean Carbon & Biochemistry, National Aeronautics and Space Administration, NSF, and NOAA), the Science Steering Committee of the U.S. GO-SHIP Program (NSF and NOAA), and the Community Earth System Model Advisory Board (National Center for Atmospheric Research, University Corporation for Atmospheric Research, and NSF). At the New England Aquarium, he is a science advisor for the Changemakers: Advancing Community Science Literacy project and is on the Science Partnership Committee for the National Network for Oceans and Climate Change Interpretation, a joint project of the aquarium, Woods Hole Oceanographic Institution, and the Frameworks Institute. At the University, Professor Doney serves on the Steering Committee of the Environmental Resilience Institute.

Howard E. Epstein is chair of the Department of Environmental Sciences. He a member of the Board of Directors of the Arctic Research Consortium of the United States and a contributing author for the Intergovernmental Panel on Climate Change's *Special Report on the Ocean and Cryosphere in a Changing Climate*. He is cochair of the Vegetation Dynamics Working Group, part of NASA's Arctic Boreal Vulnerability Experiment, as well as of the Environmental Working Group of the Digital Belt and Road Initiative, sponsored by the Chinese Academy of Sciences. At the University, Professor Epstein is

codirector of the College Science Scholars program and serves on the College and Graduate School of Arts & Sciences Committee to Imagine the Future of the Graduate School. He is a faculty fellow of the Echols Scholars Program, a faculty panelist for Days on the Lawn, and a judge for the Robert Huskey Graduate Research Award.

James N. Galloway, the Sidman P. Poole Professor of Environmental Sciences, was elected to the National Academy of Sciences. He is a member of the Steering Committee of the International Nitrogen Initiative as well as the initiative's North American center. For the National Socio-Environmental Synthesis Center, Professor Galloway serves on the Committee on Food Waste and the Environment and is cochair of its Workshop on Integrated Footprints. He is vice chairman of the Board of Trustees of the Bermuda Institute of Ocean Sciences (formerly the Bermuda Biological Station for Research) and a member of its Education, Science, Compensation, and Nominating Committees as well as its ad hoc Committee on Governmental Relations. In addition, Professor Galloway is an associate editor of *Environmental Development*, a trustee of the Marine Biological Laboratory at Woods Hole, Massachusetts, and a member of its Nomination and Governance Committee and its Academic and Campus Strategy Committee. He is a member of the University Committee on Sustainability and serves as cochair of its Nitrogen Working Group and as a member of its Environmental Stewardship Subcommittee and its Teaching and Research Subcommittee.

Kevin Grise is co-chair of the Changing Width of the Tropical Belt Working Group, sponsored by the United States Climate Variability and Predictability Program. He also represents UVA at the University Corporation for Atmospheric Research. This year, the department awarded him its Maury-Tice Prize for research excellence.

Kyle Haynes is on the editorial board of *Ecography*.

Janet S. Herman is president of the Karst Waters Institute and chairs the Award Committee for its William L. Wilson Scholarship in Karst Science. She is a campus representative of the Geological Society of America as well as a member of its Membership and Fellowship Committee. In addition, Professor Herman has served as a panelist for the National Science Foundation panel on Hydrologic Science as well as its panel on Dynamics of Coupled Natural and Human Systems. At the University, Professor Herman is a member of the Faculty Senate and a member of its Diversity and Inclusion Committee.

William Keene (retired) is vice president of the University of Virginia Chapter of the American Association of University Professors.

Deborah Lawrence directs the department's Environmental Thought and Practice program and chairs its committee on its future. She is a member of the Climate Strategies Committee of the International Climate Policy Research group as well as the Steering Committee of the Community Climate Intervention Strategies Working Group at the National Center for Atmospheric Research. She also serves on the Trustee Council of The Nature Conservancy and as secretary of its Virginia Chapter. Professor Lawrence is the University's Sustainability Faculty Teaching Fellow and was presented with the Outstanding Faculty Member Award by the UVA Student Council Sustainability Committee. She is a member of the University Committee on Sustainability, the Global Studies Curriculum Committee, and the Advisory Board of the *Virginia Environmental Law Review*, which is edited by students at the School of Law.

Manuel Lerdau is an associate editor of *Biology Letters* and guest editor of *Ecological Applications*. He is also a member of the Biogeochemistry Working Group at the National Ecological Observatory Network and the NASA JPL Biosphere/Atmosphere Pollution/Climate Change Working Group. At the University, Professor Lerdau serves on the University's Sexual Misconduct Board, the College and Graduate School of Arts & Sciences Faculty Rules Committee, the Southeast Asia Studies Committee, and the Sustainability @UVA initiative. He is steering committee chair for Directors of Diversity and Inclusion and a member of its Advisory Committee. He also chairs the Nelson Scholars Program for Southeast Asian Studies Fund Committee and mentors students working at the Morven Kitchen Garden.

Stephen A. Macko serves on the Committee on Education of the European Geosciences Union and is editor-in-chief of *Nitrogen*, section editor-in-chief of *Geosciences*, and a member of the Editorial Board of *Minerals*. He is on the Advisory Board of *Oxford Research Encyclopedias: Environmental Science*. At the University, he is a member of the Faculty Senate and its Policy Committee, the Provost's Academic Strategy Committee, the Summer Session Advisory Committee, and the University Libraries Committee. He also serves as a judge of the University's Double 'Hoo Competition, the Harrison Awards Competition, the Virginia Space Grant Competition, and the Huskey Graduate Research Award.

Karen J. McGlathery is the lead principal investigator of the Virginia Coast Reserve Long-Term Ecological Research (VCR-LTER) program and sits on the national LTER Science Council and the Advisory Committees of the Florida Coastal Everglades LTER and the Moorea Coral Reef LTER. In addition, Professor McGlathery is an associate editor of *Ecosystems*, a member of the Research and Education Advisory Council of Virginia Sea Grant, and a member of the board of the Foundation of the State Arboretum of Virginia. She also serves as the UVA representative to the Association of Public and Land-Grant Universities Board on Oceans, Atmosphere, and Climate.

At the University, she is director of the Environmental Resilience Institute, a senior fellow at the UVA Society of Fellows, and was named an Outstanding Faculty Speaker by the Office o Engagement. She serves on the University's Yamuna River Project and as an advisor to the Coastal Conservatory Environmental Humanities Consortium. Professor McGlathery serves on the Committee on Sustainability, the President's Task Force on the Emmet-Ivy Corridor, and the President's Morven Farm Working Group.

Aaron L. Mills serves as the science advisor for the UVA-Guatemala Initiative, as Secretary of the Faculty of Arts & Sciences, and as a member of the University Assessment Advisory Committee.

Michael Pace is president of the Association for the Science of Limnology and Oceanography.

John Porter is a member of the national LTER Network Information System Advisory Committee and advisor to the Luquillo LTER.

Sally Pusede is a member of the Student Airborne Research Program and the Ozone Water-Land Environmental Transition Study, both of which won a NASA Group Achievement Award in 2019. She is a co-editor of *Atmospheric Chemistry and Physics*. In addition, Professor Pusede organized a session on Biosphere-Atmosphere Interactions and Atmospheric Chemistry for the American Geophysical Union. At the University, she was a founding member of Intersections of Urban Inequality.

Carleton Ray is on the Editorial Board of *Aquatic Conservation: Marine and Freshwater Ecosystems*. He also is a member of the Advisory Board of The Ocean Foundation and is a member of the Scientific Advisory Committee of the Bahamas National Trust.

Matthew Reidenbach is an associate editor of *Frontiers in Marine Science*.

Todd Scanlon was a panelist for the National Science Foundation's Frontier Research in Earth Sciences program and serves locally as vice chair of the Science Advisory Committee of the Rivanna Conservation Alliance's Shenandoah National Park Science Team. This year, the department awarded him its Maury-Tice Prize for research excellence.

Herman H. Shugart, the W. W. Corcoran Professor of Environmental Sciences, was presented Japan GeoScience Union's 2019 Award for most cited paper in its journal, *Progress in Earth and Planetary Science*. His work is also included in the Web of Science Highly Cited Paper index. He is a member of the International Council of Siberian Federal University, a member and U.S. observer of the BIOMASS Mission Assessment Group of the European Space Agency, and a member of the Intelligence Science and Technology Experts Group at the National Academies of Science, Engineering, and Medicine. He is editor-in-chief of *Oxford Research Encyclopedias: Environmental Science* and a member of the Editorial Boards of *Ecological Processes*, *The Sejm Review*, and *Forest Ecosystems*.

Lauren Simkins is on the Books Editorial Committee of the Geological Society of London and is a panelist for the National Science Foundation's Polar Programs. At the University, she serves as a mentor to the Louis Stokes Alliance for Minority Participation Bridge to Doctorate program and the Mentoring Institute of the Office of Graduate & ostdoctoral Diversity Affairs. She also judges the Undergraduate Research Symposium.

David E. Smith received the Department Chair's Award, which recognizes an individual who has performed extraordinary service to the Department of Environmental Sciences. He serves on the University's Facilities Management Advisory Board and the Athletics Advisory Council. This year, he was named an Outstanding Faculty Speaker by the University's Offic of Engagement.

Patricia Wiberg serves on the executive committee of the American Geophysical Union's Earth and Planetary Surface Processes Focus Group. She is also an associate editor of *ESurf* and a member of the Editorial Committee of the *Annual Review of Marine Science*. In addition, she serves on the Steering Committee of the National Science Foundation-sponsored Community Sediment Dynamics Modeling System and on the Advisory Board of the Sediment Workgroup, part of the Regional Monitoring Program for Water Quality in San Francisco Bay. At the University, she is a member of the Steering Committee of the College and Graduate School of Arts & Sciences.

Xi Yang serves on the Foliar Sampling Technical Working Group of the National Science Foundation's National Ecological Observatory Network. He is also on the Steering Committee for Flux Course, a two-week educational program for graduate students sponsored by the AmeriFlux Network.

PEER-REVIEWED PAPERS, BOOK CHAPTERS, AND BOOKS

(Summer 2019 through Spring 2020)

Anderson, J.B., **Simkins, L.M.**, Bart, P.J., De Santis, L., Halberstadt, A.R.W., Olivo, E. and Greenwood, S.L., 2019. Seismic and geomorphic records of Antarctic Ice Sheet evolution in the Ross Sea and controlling factors in its behaviour. *Geological Society, London, Special Publications*, *475*(1), pp.223–240. doi: 10.1144/SP475.5

Aoki, L.R. and **McGlathery, K.J.**, 2019. High rates of N fixation in seagrass sediments measured via a direct 30N2 push-pull method. *Marine Ecology Progress Series*, *616*, pp.1–11. doi: 10.3354/meps12961

Aoki, L.R., **McGlathery, K.J.** and Oreska, M.P., 2020. Seagrass restoration reestablishes the coastal nitrogen filter through enhanced burial. *Limnology and Oceanography*, *65*(1), pp.1–12. doi 10.1002/lno.11241

Aoki, L.R., **McGlathery, K.J.**, **Wiberg, P.L.** and Al-Haj, A., 2020. Depth affects seagrass restoration success and resilience to marine heat wave disturbance. *Estuaries and Coasts*, *43*(2), pp.316–328. doi: 10.1007/s12237-019-00685-0

Archibald, K.M., Siegel, D.A. and **Doney, S.C.**, 2019. Modeling the impact of zooplankton diel vertical migration on the carbon export flux of the biological pump. *Global Biogeochemical Cycles*, *33*(2), pp.181–199. doi: 10.1029/2018gb005983

Atkins, J.W., Bond-Lamberty, B., Fahey, R.T., Hardiman, B.S., Haber, L., Stuart-Haëntjens, E., LaRue, E., McNeil, B., Orwig, D.A., Stovall, A.E., Tallant, J. and **Walter, J.A.**, 2019. Multidimensional structural characterization is required to detect and differentiate among moderate disturbance agents. *Ecosphere* e03156. doi: 10.1002/ecs2.3156

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Attard, K.M., Rodil, I.F., Glud, R.N., **Berg, P.**, Norkko, J. and Norkko, A., 2019. Seasonal ecosystem metabolism across shallow benthic habitats measured by aquatic eddy covariance. *Limnology and oceanography letters*, *4*(3), pp.79–86. doi: 10.1002/lol2.10107

Babić, N. and **De Wekker, S.F.**, 2019. Characteristics of roll and cellular convection in a deep and wide semiarid valley: A large-eddy simulation study. *Atmospheric Research*, *223*, pp.74–87. doi: 10.1016/j.atmosres.2019.03.009

Beaupré, S.R., Kieber, D.J., **Keene, W.C.**, Long, M.S., Maben, J.R., Lu, X., Zhu, Y., Frossard, A.A., Kinsey, J.D., Duplessis, P. and Chang, R.Y.W., 2019. Oceanic efflu of ancient marine dissolved organic carbon in primary marine aerosol. *Science advances*, *5*(10), p.eaax6535. doi: 10.1126/sciadv.aax6535

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