



ENVIRONMENTAL SCIENCES

AT THE UNIVERSITY OF VIRGINIA

Collaborating Across the University

2020-21 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 Bland Experimental Farm near Front Royal, Virginia.

FROM THE CHAIR

When it was founded in 1969, our department was the first of its kind in the fledgling field of environmental science. It has taken half a century for this discipline to achieve the stature of more established disciplines such as chemistry, biology, physics, and astronomy, but as the wealth of cross-University collaborations detailed in this report demonstrates, the environmental sciences are now firmly in the mainstream of scientific inquiry.

There are many reasons for this. For one, the environmental sciences are at the forefront of technological innovation. Sensors on Earth and on satellites are generating vast quantities of data, with greater frequency and finer resolution than ever before. At UVA, our faculty has seized this opportunity to enhance techniques used to analyze, model, and simulate complex, interrelated environmental processes, and we are collaborating with the School of Data Science to improve these capabilities.

The movement to achieve a more just and equitable society has also underscored the importance of the environmental sciences. Communities of color and those ranking high on the Centers for Disease Control's Social Vulnerability Index currently suffer disproportionately from pollution and are expected to bear the brunt of climate change. Members of this department are collaborating with UVA colleagues from architecture, the humanities, and the social sciences to provide these communities with the knowledge and the tools they need to mitigate and manage change.

Ultimately, though, it is the climate crisis that has thrust the environmental sciences into the spotlight and spurred collaborations across the University. These collaborations are helping us to shed more light on the environmental changes that society will experience from a warmer planet. For example, partnerships with the Engineering and Architecture Schools can provide a roadmap for effective solutions and responses, especially for vulnerable communities. Joint projects with the School of Medicine are also helping to increase understanding of the implications of climate change for human health.

While the department has extensive research relationships with institutions across the United States and around the world, it is a testament to the stature of the University that we are able to launch productive and innovative projects with colleagues across Grounds.



Howie Epstein, Chair





Retirements

The retirement of faculty members is an opportunity to reflect on the impact they have had – the product of decades of curiosity, creativity, and sheer hard work – on their chosen fields.

Building Communities that Strengthen the Profession

When **Janet Herman** joined the Department of Environmental Sciences in 1982 as a hydrogeochemist, she was the only woman in a faculty of 24. Things had not changed significantly six years later when she became the only tenured woman scientist in the College of Arts & Sciences. This situation did not come as a surprise to Herman.

“The feeling at the time was that the geosciences were more appropriate for men,” she recalls. “When I left the room after chairing my first technical session at the Geological Society of America annual meeting, I heard a graduate student say, ‘Wow, I’ve never seen a woman chair a session before.’ It was clear I needed to create opportunities for other women.”

Establishing Women in the Sciences

That is exactly what she did. In addition to becoming one of the leading karst scientists in the country, Herman, who retired at the end of the 2020–21 academic year, is highly regarded for her efforts to promote women in the geosciences,

not just at the University but across the profession.

Of the 33 graduate students she advised during her 39 years at UVA, 24 were women. Over that same period, she advised 24 senior theses, of which 14 were written by women. And working with Engineering School Professors Roseanne Ford and Teresa Culver, she wrote a series of successful proposals for graduate fellowships to the National Science Foundation (NSF) and the Department of Education. They argued that the best way to solve pressing water resource problems was to increase the diversity of young scientists and engineers.

“Our goal went beyond support and mentoring to providing a sense of community for our women graduate students,” she says. “I wanted our students to know that there were people who knew them and cared about them.”

Herman has been nationally recognized for her pioneering efforts. In 1996, she was among the first group selected for the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring, and in 2008, she was named Outstanding Educator of

the Year by the Association for Women Geoscientists. At UVA, she was the first person to win an Excellence in Faculty Mentoring Award when the program was introduced in 2007.

Creating a Focal Point for Karst Research

Herman has also been a vigorous advocate for the study of karst hydrogeology, characterized by water flowing through limestone bedrock creating caverns, sinkholes, springs, and disappearing streams. In the United States, karst makes up over a fifth of the total landscape, and karst aquifers provide 25 percent of the nation’s drinking water supply.

Herman was named a fellow of the Geological Society of America for her work in the field and was one of the founders of the Karst Waters Institute. “Because we were encountering difficulty securing funding from traditional sources like the NSF, we decided to create a multi-institutional collaborative dedicated to research, education, and outreach,” she says.

Since the organization’s founding in the early 1990s, it has held over 15 interdisciplinary scientific meetings, produced resource materials for K–12 students, and organized dozens of technical sessions at conferences. It also awards an annual graduate-student fellowship.

Although Herman has retained her post as president of the institute, she relishes her freedom from the academic calendar now that she has retired from the University, for instance, scheduling a hiking trip with family to Oregon when she would normally be teaching. “One of the great things about retirement has been the opportunity to travel in September,” she says. “It was wonderful.”

Janet Herman and her family during a fall trip to Mount Hood.



FAMILY PHOTO



Carleton Ray and Jerry McCormick-Ray are retiring after 40 years in the department.

United by their Devotion to Marine Conservation

In theory, research faculty have the latitude to pursue their interests wherever they lead, but, in practice, they are subject to the shifting priorities of funders. Research Professor **Carleton Ray** and Senior Scientist **Jerry McCormick-Ray** have sometimes had to regroup and recalibrate their research, but on the whole they have been remarkably successful in maintaining their focus on coastal-marine conservation and science.

After 40 years in the department, the couple will be retiring at the end of the 2021–22 academic year. “We’ve worked individually and collaboratively, writing several books and papers together. That has been very satisfying,” Carleton says.

Staying True to their Interests

Carleton has drawn on expertise in a number of scientific disciplines — physiology, taxonomy, oceanography, acoustics, and behavior — to make contributions to such fields as coastal and marine biodiversity, land and seascape ecology, marine mammal ecology, and physiological ecology. He discovered a dozen new species, was the first to use scuba-diving for research on marine mammals in Antarctica and the Bering Sea, and was among the first to describe the underwater sounds of seals and walruses as song in the strict behavioral sense.

Jerry’s progression has been, if anything, even more remarkable. She got her start working with marine mammals

as a Sea Maid at San Diego’s Sea World. The expertise she gained training seals, dolphins, and orcas set the stage for her collaboration with Carleton on seal vision. Her work on oyster diseases — and the interaction between people and the environment that contributes to them — has immersed her in the history of the Chesapeake Bay. “Thanks to Alderman Library’s vast historical holdings, UVA has been the perfect place for this kind of research,” she says.

Comfortable at Multiple Scales

Their recent work in the Arctic highlights their comfort moving back and forth between different spatial resolutions. Using a combination of shipboard and submersible observations, satellite data, ice floe tracking, and input from indigenous hunters, they monitored walrus distribution, feeding patterns, and sea-ice structure.

The walrus is a keystone species. In their quest to extract clams and other invertebrates from the bottom of the shallow Bering and Chukchi seas, they churn up essential nutrients that support other marine creatures and help make these bodies of water among the most productive in the world. The Rays’ research suggests how climate change will disrupt this ecosystem. The walruses depend on broken packed ice floes to carry them to areas where they feed, breed, and raise their calves. As the Arctic warms, these floes have begun to disappear, putting

walrus populations at risk and threatening the productivity of the ecosystem. For indigenous communities whose way of life depends on the services this ecosystem provides, this could be a disaster.

“The fate of charismatic species like the walrus is telling us something about the condition of our environment,” Carleton says. “It’s time we seriously paid attention.”

Leaving an Institutional Legacy

In addition to their research, Carleton and Jerry have devoted themselves to consulting with international conservation groups and government agencies to establish marine protected areas. Working with the International Union for Conservation of Nature and Natural Resources, they helped lead the first international effort that focused on marine conservation. In the late 1950s, Carleton joined forces with Iliia Tolstoy, an explorer and grandson of the Russian writer, and a group of conservationists in the Bahamas to document the need for an underwater national park. Their work led to the creation of the world’s first land and sea park in the Exumas and the formation of the Bahamas National Trust, which acquires lands and manages protected areas. Carleton was named a Conservation Legend in 2020 for this work.

“Conservation has not always commanded the respect it should have in the scientific community,” Carleton says. “We’ve always tried to demonstrate the importance of science-based conservation.” The couple continue their work today on four species as Ambassadors of the Sea.



At the Intersection of the Sciences

Answers to pressing research questions—especially those with far-reaching implications for society—often lie at the boundaries of related disciplines. That is why collaborations between department members and other scientists at the University flourish.



Finding Valid Connections between Weather and Health

The research partnership of **Bob Davis** and **Wendy Novicoff** is a marriage of hearts as well as minds. The couple, who have been married for 20 years, have converging interests. Novicoff is a professor of public health sciences and orthopedic surgery and has always been concerned with health outcomes. Davis, a climatologist, is also interested in outcomes. In his case, they often involve the impact of weather and climate on human health. In addition, both are statisticians with expertise working with large datasets.

There is no doubt, however, that living under the same roof has made it easier to see the potential of collaboration. “Like most couples, we often discuss what’s been happening at work over dinner,” Novicoff says. “We had seen researchers try to connect weather and health, but the datasets are so idiosyncratic and specialized that you need expertise in both areas if you are to have a chance of drawing valid conclusions.”

Another obstacle that both clinicians and climatologists face is access to medical data, which is subject to stringent privacy restrictions under the Health Insurance Portability and Accountability Act (HIPAA). Novicoff has the credentials to access HIPAA data and years of experience using it.

“We realized that we had much of the knowledge and many of the skillsets to make progress quite literally in house,” Davis adds. “We thought we would give it a try.”

Heat and Emergency Department Admissions

Novicoff and Davis began collaborating almost 20 years ago — and recently have partnered on several projects selected for the University’s 3Cavaliers program, which funds groups of three faculty members from at least two disciplines to pursue innovative research.

As part of the first 3Cavaliers project, Davis and Novicoff looked at the influence of long-term seasonal and daily weather and climate changes on hospital and emergency department admissions at healthcare facilities in central and southwest Virginia. For instance, seasonal variations in air quality and pollen affect respiratory distress; heat and cold waves strain cardiovascular and respiratory systems; and influenza transmission has been linked to periods of cold and dry air. The team wanted to determine if these relationships were robust enough to enable healthcare facilities to use them to support their staffing and resources allocations.

To do so, they used statistical models to analyze daily weather data from National Weather Service observation stations through the Commonwealth as well as patient electronic medical records and daily hospitalization data from facilities in Virginia. “Among our findings, we noted that you tend to get a 10 percent increase in emergency department visits on the day of or the day following a heat event,” Davis says, “but 10 percent is probably not enough to change staffing.”

An important advantage of 3Cavalier funding is that it has allowed Davis and Novicoff to introduce undergraduates to the research process. “We involved students in every step: pulling the weather data, addressing missing data, calculating parameters, and running the models,” Davis says. “They also coauthored the papers we published. It was a growth experience for them.”

After comparing notes about their research over dinner, Bob Davis and his wife, Wendy Novicoff, decided to collaborate at the intersection of climatology and public health.



JASMINE MICHELLE

Identifying Feedback between Evolution and Ecology

One of the things we know about *Lymantria dispar*, the invasive insect sometimes called the gypsy moth, is exactly how and when it came to the United States. But what we don't fully understand, now that it's here, is the interplay of ecological and evolutionary mechanisms that guide the expansion of its range. Research Associate Professor **Kyle Haynes**, collaborating with **Douglas Taylor**, the Commonwealth Professor of Biology, is trying to shed light on this process.

"The moth's range doesn't expand in a uniform way," Haynes says. "We're trying to identify the evolutionary responses to changes in such ecological factors as weather and population dispersion."

One of America's Most Closely Watched Insects

The introduction of *Lymantria dispar* sounds like something from a Wes Anderson movie. In 1869, Étienne Léopold Trouvelot, a French artist, astronomer, and amateur entomologist living in the Boston suburbs, imported *Lymantria dispar* egg masses from Europe in hopes of breeding them with indigenous silk moths. His idea was to establish a silk industry in the United States.

Trouvelot's plans for the moth were a colossal failure, but for the moths themselves, the trip was wildly successful. By the time Trouvelot returned to France in 1882, the moths, who quickly found their way into the trees behind his house, had spread across New England. And while they are not particularly fond of coniferous trees, they have been known to feed on over 200 different species of trees and shrubs, retarding their growth and increasing mortality.

Currently, *Lymantria dispar* are expanding on a front that ranges from Minnesota in the northwest to North Carolina in the southeast. According to the U.S. Forest Service, 83 million acres have been defoliated by the moth since 1970.

It is precisely because they have been such destructive pests for so long

that *Lymantria dispar* makes such a great candidate for understanding the intersection of ecology and evolution.

Decades of data about the moth existed even before the Forest Service authorized its Slow the Spread program in 2000. Workers set traps every year along the edge of its current range to monitor its spread. "I've been attracted throughout my career by the opportunity to study phenomena on landscape and regional scales," Haynes says. "This is easier to do with *Lymantria dispar* than with many other species."

Populations at a Tipping Point

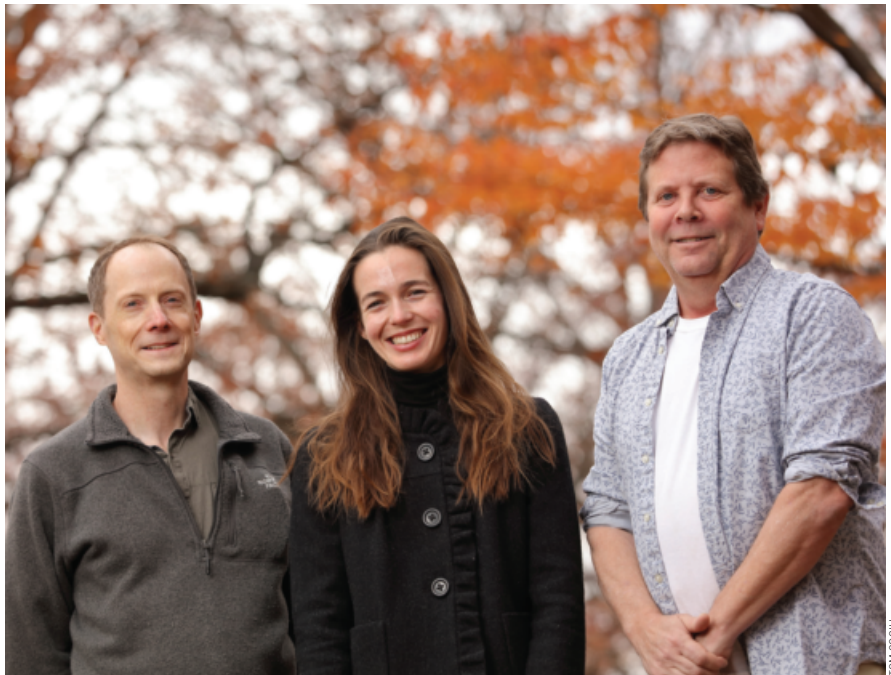
An important inspiration for the collaboration between Haynes and Taylor was Haynes' graduate student **Clare Rodenberg**. "It was because Clare wanted us also to consider the evolutionary dynamics of spread that we reached out to Doug," Haynes says.

To pursue this work, Rodenberg secured funding from UVA's EXPAND grant program, an NSF-sponsored initiative designed to support graduate students pursuing interdisciplinary research and nontraditional careers. "The program focuses on phenotypes — the characteristics of an individual resulting from the interaction of its genotype with the environment — making it ideal for Clare," Haynes says.

Among the issues the team is considering are the conflicting

Kyle Haynes, Clare Rodenberg, and Doug Taylor (l-r) are exploring the evolutionary and ecological factors that determine the spread of a destructive species.

evolutionary pressures at the extremes of the moth's range — heat in the south, cold in the north. They are studying ecological variables that affect population dynamics — connectivity of wooded areas, for instance — and exploring the way these dynamics affect genetic diversity and adaptability — which in turn affect population dynamics. For instance, at low population densities, moths have difficulty finding a mate, a situation that can limit their genetic diversity and reduce their ability to adapt to changing climate — and reduce populations further. "We're interested in these feedback loops, both for what they tell us about how better to control *Lymantria dispar*," Haynes says, "but also for the light they shed on the broader context of ecological and evolutionary theory."



TOM COGILL



Education

As the events of the last two years have shown, society's ability to respond effectively to pressing global challenges depends on the general public having an appreciation for the way science works.

Popularizing an Evidence-Based Approach to Teaching Science

An assumption that is all too common among university and public school administrators is that mastery of science translates into excellent science teaching. **Cora Baird**, site director at the Virginia Coast Reserve – Long-Term Ecological Research project (VCR – LTER), understood that this belief undermined effective science education. As part of her application for funding under the National Science Foundation's Research Experience for Teachers (RET) program, she wanted to provide a framework that would enable participants to translate their research experience into pedagogical methods that would open up science learning for their students.

"As a scientist, evidence is very important to me," Baird says. "I wanted to

familiarize teachers with evidence-based methods that would enable their students, regardless of background, to apply science practices to real-world questions."

Knowing she would need an education expert to help her write a proposal, Baird reached out to **Sarah Fick**, a research assistant professor in UVA's School of Education and Human Development. Now an assistant professor at Washington State University, Fick studies how people learn science, as well as teaching science methods courses for K–12 teachers.

"It has been an excellent partnership," Fick says. "We have very similar perspectives on how best to support teachers incorporating science in their classrooms, especially in rural areas like the Eastern Shore."

the professional development segment of the program, which they customized to Stevens' goals and approach to the classroom. They used Stevens' own research experience as a model for engaging students — for instance, stressing the value she found in formulating open-ended questions, using systems thinking and modeling to understand phenomena, and letting investigations drive the learning of concepts and skills.

"We began by talking with Cindy about how she teaches science and her assumptions about how students learn," Baird says. "We then introduced her to the research about effective science education." During the course of the following school year, Baird periodically sat in on Stevens' classes to keep the conversation going.

Giving Graduate Students Tools to be Better Mentors

Baird and Fick's RET had unexpected consequences. A number of graduate students conducting research at the LTER observed Baird working with Stevens and were intrigued. One of their responsibilities is to mentor undergraduate students. They thought they could be more effective if they understood some of the principles that shaped Baird's guidance.

Baird and Fick responded by developing an online workshop called Fundamentals of Learning for Science Mentors. "The course gave us a chance to take a bite-sized chunk of education theory and adapt it for mentoring," Baird says. "Researchers at the VCR – LTER and their environmental science colleagues at their home institutions are eligible to take it." Over the last two years, 18 graduate students have enrolled and given it high marks.

The work the pair put into this project bore fruit in 2021. After canceling the summer program in 2020 due to the pandemic, they hosted three teachers in 2021. "Sarah felt that one of the best ways to improve the experience was to have teachers learning together," Baird says. And both strands of the program came together: the teachers were mentored by graduate students who had completed the online course.

Using a Teacher's Own Experience as a Template for Instruction

Their grant proposal evidently resonated with the NSF — and in summer 2019, Baird and Fick hosted Cindy Stevens, a fifth-grade teacher from nearby Accomack County, for a six-week session. She measured decomposition of soils across a marsh gradient and used observations and sample analyses to develop a set of predictors, including moisture, salinity, and sun and shade.

Baird and Fick had created learning goals for

In addition to studying soil decomposition in marshes, Cindy Stevens, a former fifth-grade teacher, focused on learning evidence-based methods of teaching science.



CORA BAIRD

Promoting Indigenous Engagement in Environmental Sciences

Not all cross-University collaborations originate with faculty members. Thanks to their initiative and persistence, quite often it is UVA undergraduates who provide the catalyst for cross-University collaborations — and who take a major role in carrying them out. For instance, it was undergraduate **Megan Eisenfelder** (Col '20) who was the driving force behind the University of Virginia and Sisseton Wahpeton Oyate Partnership for Rangeland Ecology. As part of this partnership, UVA students and Native Americans are jointly conducting research and running a summer educational program for young people on the tribe's reservation in South Dakota.

"I came to UVA thinking I wanted to be a professor and conduct research, and the project confirmed my intentions," says fourth-year environmental sciences major **Sophie Wong** (Col '22), now one of the leaders of the project. "One of the great things for me about this program is the way it returns knowledge to the community."

A Student-Driven Collaboration

The germ of this project was a casual remark that **David Edmunds**, an associate professor of global studies, made to Eisenfelder, a double-major in global studies and biology. In the course of working with the tribe on other projects, Edmunds heard about an interesting discovery that Gerald German, a tribal member who manages both bison and cattle herds, had made — native plants seemed to be returning to fields the bison grazed. Interested in giving the experiment a scientific basis, Eisenfelder contacted Professor **Howie Epstein**, who has expertise in grassland ecology, for insight on how to structure the research project.

During summer 2017, Eisenfelder traveled to the Lake Traverse Reservation in Sisseton, South Dakota, to launch the

project. Noticing that tribal members were interested in her work, she returned the following summer with a youth education program. That was four years ago. "One reason that the program has endured is that Megan was very good about getting new students interested," Epstein says.

Eisenfelder recruited Wong in 2019 to assist her in the lab. Although Wong now shares responsibility for managing the entire project and securing funding, her focus is still on the science. The underlying hypothesis is that since bison coevolved with the native tallgrass prairie, bison grazing will increase plant heterogeneity and overall productivity of the ecosystem.

Although fieldwork was suspended in 2020, the results from last summer's observations are suggestive. "We are seeing a resurgence of typical tallgrass prairie species — grasses and forbs — often used as medicinal plants by the Dakota tribes," says Wong, though the year of missing data and unusually dry conditions make it difficult to draw firm conclusions.

Creating a Self-Sustaining Educational Program

The educational component of the program has evolved over time as well. The goal of the one-to-two-week summer session is to provide students with hands-on

Sophie Wong (Col '22) is documenting the resurgence of native plants on land grazed by buffalo on the Lake Traverse Reservation in South Dakota.

experience in environmental research and scientific methods. Over the last two years, students have been learning how to collect and analyze samples from a lake on the reservation to determine water quality. The team has also included more material on environmental justice and fundamental academic skills in the curriculum.

Although conditions for conducting classes virtually during summer 2020 were not ideal, it did encourage greater collaboration between UVA students and Dusty Gill, their partner at Lake Traverse. Gill invited the students to camp on her property for the week of classes and — while the UVA team recruited guest speakers on topics like water laws and the glacial history of the region — Gill took more responsibility for overseeing the program and bringing in local speakers. The summer 2021 session featured in-person and virtual presentations on the Dakota language, Native American and Western views of astronomy, and invasive species.

"This year, from the list of lessons we compiled, our community partners chose the ones they wanted to present," Wong says. "Our ultimate goal is to make the summer session sustainable."



ALEXIS TILLOT

Social Change and Environmental Justice

Although science plays a critical role in enabling society to confront environmental challenges, effecting sustainable solutions requires equitable engagement with local communities. And for environmental scientists and engineers, this means collaborating with the social sciences, architecture, and the humanities.

Transcending Convenient Distinctions

When it comes to cross-university collaboration, **Lawrence Band** has an edge. For much of his career, Band has held joint appointments in two disciplines. At UVA, his time is split evenly between the Department of Environmental Sciences, where he is the Ernest H. Ern Professor, and the Department of Engineering Systems and Environment.

Band is an ecohydrologist who often applies principles developed from his research in unmanaged but not untouched ecosystems to urban ecosystem restoration. “The work I do demands an interdisciplinary approach, and a joint appointment gives me the benefit of proximity” he says. “Just the ease with which I can exchange ideas with colleagues from engineering and also have students with different backgrounds and skills, can lead to fresh insights and new projects, both as an educator and researcher.”

Working in Concert with Local Communities

For instance, Band has joined with Professor **Teresa Culver**, a colleague in the Department of Engineering Systems and Environment, and Associate Professor **Bev Wilson** from the Department of Urban and Environmental Planning to explore ways to undertake watershed restoration that are consistent with the principles of environmental equity. The project is supported by the University’s 3Cavaliers program, which provides seed funding for collaborations of three faculty members from at least two disciplines.

As a case study, they are using Meadow Creek, which flows north from the University, ultimately emptying into the Rivanna River. Portions of this stream were restored a decade ago to reduce sedimentation and improve water quality, but its carefully tapered banks are being undermined by uncontrolled stormwater

runoff from the urban parts of the watershed. As Band points out, replicating the benefits of natural processes can require infrastructure upstream in urban areas, including Green Infrastructure, which can have a host of other co-benefits for local communities. However, to be sustainable, even infrastructure as seemingly benign as rain gardens and swales have to be designed with the participation of local residents, as it is based in their neighborhood.

“Our challenge is to find ways to create interventions that are sustainable because they are co-designed with local communities and provide benefits — like reducing urban heat islands — that local communities want,” Band says. “I know hydrologic science. Teresa is an expert in engineering water resources. But we need Bev’s expertise in community planning to have a chance of producing something lasting.”

Bringing Perspectives Together in the Classroom

Band’s joint appointment also provides an exciting opportunity to integrate science and engineering in the classroom and provide students with a more unified set of perspectives than can be gained from taking related courses in separate departments. As part of his co-appointment, Band’s classes are co-listed in Environmental Science and Systems Engineering and Environment. Band is now developing a new course, Water Resources in a Changing World, that will be co-listed with his Water Resources Engineering class. It retains a foundation in civil engineering, but also emphasizes climate change, land use, and equity. “My students in both departments have been lobbying for a course like this,” he says.

Band’s challenge as an educator is finding ways to engage both groups of students. Band turns their differences in perspective into an advantage by emphasizing problem-solving and team-based methods. “I start these classes by saying you’ll probably learn as much from each other as you will from me,” he says.

Supported by the University’s 3Cavaliers program, **Teresa Culver, Bev Wilson, and Larry Band (l-r)** are developing a more sustainable approach to restoring Meadow Creek by engaging the local community.



TOM COGILL



Translating Environmental Justice into Meaningful Action

The ecology of injustice has its own rules and relationships that are deeply embedded in culture and history. It is no accident that communities of color suffer disproportionately from pollution and climate change, and that these communities are more likely to be in low-lying areas threatened by sea level rise, bisected by interstates, and surrounded by chemical plants and refineries. The ability to account for this injustice — and to address its consequences — has been undermined by preconceptions about the distinct roles of science and public policy. In an effort to bridge this divide, Assistant Professor **Sally Pusede** has joined with colleagues in African American and African Studies and History to form the Repair Lab.

“My own research focuses on using novel remote sensing observations to understand the unequal distribution of air pollution within cities,” says Pusede, one of the lab’s codirectors. “But to fully understand why pollution is higher in some neighborhoods compared to others, you have to collaborate with people with different kinds of expertise.”

Funded by UVA’s Democracy Initiative, the recently launched Repair Lab intends to go beyond scholarly exploration. It will work in concert with community organizers to set an agenda for research that yields actionable information that affected populations can use to address environmental injustice. This is a complicated undertaking. It entails understanding how communities

experience environmental injustice and determining how residents can affect policy-making. It also requires exposing the historical relationships among race, politics, and the environment and devising better ways to monitor the environmental issues facing affected communities.

Securing Comprehensive Baseline Data

Systematic assessment of air pollution within U.S. cities has been hampered by the sparse distribution of ground-based air-quality monitoring sensors. Pusede was the first to show that data from a recently launched satellite could link air pollution to environmental injustice. Using the Tropospheric Monitoring Instrument on Sentinel-5P, a European Union satellite, Pusede and graduate student Angeliqe Demetillo determined that nitrogen dioxide levels in Houston, Texas, were 32 percent higher for Latino residents, 19 percent higher for Black residents, between 15 to 28 percent higher for residents living below the poverty line, and 37 percent higher for people of color living in low-income neighborhoods. They then expanded their work, quantifying the role of diesel truck emissions in nitrogen dioxide inequality in 52 major U.S. cities. High concentrations of nitrogen dioxide have been linked to higher rates of childhood asthma, increased hospitalizations, and the development of cardiovascular diseases.

The codirectors of the Repair Lab are (l-r) Sally Pusede, Kimberly Fields, Andrew Kahrl, and Sarah Milov.

Bringing More People into the Process

As it gets up to speed, the co-directors of the Repair Lab — which include Assistant Professor **Kimberly Fields**, a political scientist in the Department of African American and African Studies, Professor **Andrew Kahrl**, who holds a joint appointment in History and African American and African Studies, and Associate Professor **Sarah Milov**, a historian — have launched a number of initiatives. The lab has created an Environmental Justice Policy Clinic focusing on issues in Virginia and the Mid-Atlantic region. It has welcomed a practitioner-in-residence, Mothers Out Front Norfolk organizer Kim Sudderth. It sponsors The Nature of Justice Workshop Series, featuring experts from across the nation. And it is working with the Main Street Speaks podcast to produce a series of episodes on environmental justice in rural areas.

“We’re exploring ways to create truly interdisciplinary research that brings together the humanities and natural sciences, as well as expertise outside of academia,” Pusede says. “We are excited about the potential of Repair Lab to break new ground.”

Assisting Eastern Shore Communities Respond to Climate Change

As difficult as it might seem to mount a coherent national response to climate change, responding at the local level can be even more demanding. The magnitude of the challenge often dwarfs the resources available to local communities. This is especially true in rural coastal areas, where sea level rise and more frequent and intense storms translate into salt-water intrusion and frequent flooding.

This year, an interdisciplinary group of faculty members at UVA led by Professor **Karen McGlathery** secured a \$4.9 million Coastlines and Peoples (CoPe) Award from the National Science Foundation (NSF) to help empower local communities in Virginia's Eastern Shore to adapt to climate change. Their goal is to create a Coastal Futures Hub that will place these communities on a more equitable footing

with the state's urban areas and create a platform — the Climate Equity Atlas — that will enable stakeholders to work together to achieve a more resilient future.

“What’s unique about this project is that every element is to be coproduced with community members,” McGlathery says. “This is the only way to capture the impacts of climate change for these communities in their entirety, and it’s the only way to create a response that’s relevant and sustainable.” One of the novel aspects of this project is that it includes funding for community stakeholders, including members of traditionally



CARIE MCGOWAN

Environmental Resilience Institute

A Model for Cross-Disciplinary Collaboration

Many of the cross-grounds relationships that made UVA's successful CoPe proposal possible arose from the activities of the Environmental Resilience Institute (ERI). Founded in 2017, the ERI was formed with the explicit recognition that crafting an effective response to a challenge as vast, complex, and seemingly intractable as climate change would require sophisticated interdisciplinary efforts at UVA and with external partners.

“Our work has been to build a

community of researchers at UVA to tackle climate change from multiple angles,” says Professor Karen McGlathery, the institute's director. “We define the issues together, create a common language, share methods, set goals, and measure our impacts. In effect, our objective is to change the way research is done to make it more solutions-focused and actionable.”

Although UVA created ERI long before the NSF launched its CoPe program, the organizers understood that the work they were contemplating meshed with the

funding priorities of federal agencies, which were increasingly interested in supporting big-problem, convergence research.

A Broad Agenda

Today, ERI has built a diverse network of researchers focused on environmental resilience and sustainability from 30 departments in nine schools and two centers. The institute focuses on three areas — climate resilience, water and energy security, and environment and health — and solicits projects twice a year through its CoLab seed grant program. Among other projects, ERI is

underserved and vulnerable groups, to help shape the project and serve as liaisons to the greater community.

Assembling a Toolkit

The first element in this effort is to collect accurate data and build environmental models of groundwater salinization and coastal flooding that incorporate the way communities actually use the land — and here local knowledge can be critical. Professors **Lawrence Band**, who has a joint appointment in the Department of Engineering Systems and Environment (ESE), and two of his colleagues there, Professor **Venkataraman Lakshmi** and Associate Professor **Teresa Culver**, will work on groundwater modeling, while Professor **Patricia Wiberg** will undertake the storm surge modeling.

At the same time, the team will assemble social and economic data to determine the communities' ability to address the environmental risks they face. This effort will entail developing a spatially explicit visualization of social equity for the region and analyzing social networks to characterize

Key CoPe researchers gathered for a kick-off meeting. They are (l-r) Josh Goldstein, Jonah Fogel (Environmental Resilience Institute), Karen McGlathery, Teresa Culver, Majid Shafiee-Jood, and Larry Band.

supporting research on the future of the Jordan River, U.S. water markets, and marsh and woodland migration in the Chesapeake Bay.

ERI receives part of its research funding from University-related groups. In 2021, the Jefferson Trust, which was founded by the UVA Alumni Association, awarded ERI a grant to identify the negative emissions strategies that are deployable in Virginia, assess their potential for carbon removal in the state, and develop a GIS-based mapping tool to determine where such strategies could be implemented.

In addition to research, ERI develops programs to raise awareness of climate issues. For instance, in the midst of the

information flows. ESE Assistant Professor **Majid Shafiee-Jood** and Research Assistant Professors **Gizem Korkmaz** and **Joshua Goldstein** from UVA's Biocomplexity Institute are among those leading these tasks. They will also be integrating them into an agent-based model combining the social and environmental relationships.

But data of itself is not a panacea. Community stakeholders must have the skills, tools, and access to information to make decisions based on the data. This is why the Climate Equity Atlas is so important. It is a user-friendly decision-support tool that all parties can use, for instance, to run "what-if" scenarios and that can serve as common ground for collaborations that promote equitable solutions.

"We want people to have a tool that allows them to assess the risks they face and understand the consequences of the choices they make," McGlathery says.

Building Community Partnerships

A key determinant of the immediate success of the Coastal Futures Hub as well as its sustainability is the engagement of Eastern Shore communities — and here the UVA team has a significant advantage, thanks to the department's 35-year record of stewardship administering the NSF's

pandemic, it organized a two-week Climate Ambition Summit featuring speakers, panels, and student engagement projects that was attended by over 3,000 UVA faculty, students, staff, alumni, and friends. Its other education initiatives include a graduate fellowship program, and both January-term and summer internship programs for undergraduates at government agencies, nonprofits, and corporations.

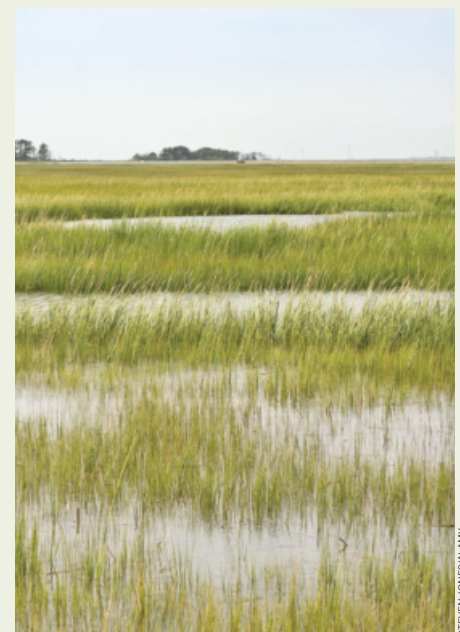
"Our approach at ERI is to provide a broad slate of programs that accelerates the rate of discovery, trains the next generation of leaders, and develops partnerships that translate research into policy and practice," McGlathery says.

Virginia Coast Reserve – Long-Term Ecological Research project, headquartered in the coastal community of Oyster.

"We've invested in local communities and developed many important relationships with community leaders that will provide an opening for our work, as have our partners, which include William & Mary's Virginia Coastal Policy Center and Old Dominion University's Resilience Collaborative," McGlathery says. "This project will effectively take these relationships to the next level." Associate Professor **Barbara Brown Wilson**, from the Department of Urban + Environmental Planning and faculty director of UVA's Equity Center, will be instrumental in advancing this part of the project.

The team will also hold community workshops and focus groups with residents to map out the problems they wish to address, set the agenda for joint fact-finding missions, and ensure that the Climate Equity Atlas is both usable and useful. UVA's Institute for Engagement and Negotiation is a key partner in this endeavor. The team will also work with local stakeholders to heighten data literacy.

"UVA was one of just five groups nationally to be awarded a CoPe grant," McGlathery says. "We have laid out an ambitious agenda with the goal of making our environmental science research actionable and improving lives on Virginia's rural coast."



Awards, Appointments, and Publications

DEPARTMENT VOLUNTEERS

Ordinarily, the Department Chair's Award is given to an individual who has performed extraordinary service to the department. This year, the department presented it to the volunteers from across our community who responded to the call for social justice by serving on our Diversity, Equity, and Inclusion Committee and on our URGE Pod. This is a National Science Foundation-funded initiative to address the effects of racism on the participation of Black, Brown, and indigenous people in geoscience.

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 **Shuoyun (Celeste) Tong** and the Mahlon G. Kelly Prize in ecology to **Sarah E. Cox**. The department presented its Hydrology Award to **Wayne F. Dawson III** and the Wilbur A. Nelson Award in geosciences to **Sarah E. Lang**.

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

Selina L. Cheng 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 **Henry R. Chin**.

Jacob S. Slawson received the Richard Scott Mitchell Scholarship, which provides \$1,800 to a rising fourth-year student who is focusing on geoscience and has completed Fundamentals of Geology and two other advanced courses in geoscience, preferably including mineralogy or petrology.

Katharine C. Schlachter 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."

Caden M. Perry 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.

Jacob Bushey, Ryley Crow, Kendall Hanks, and **Magnolia Matthews** presented posters at the all-University Undergraduate Research Symposium.

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 **Selina L. Cheng, Ryley S. Crow, Sarah E. Lang,** and **Jacob S. Slawson** as distinguished majors.

Jacob H. Bushey, Davis Coffey, and **William B. Miller** won University of Virginia Harrison Undergraduate Research Awards. With an endowment from the family of the late David A. Harrison III, the Harrison Awards were first presented in 2000. Each year, approximately 50 awards of up to \$4,000 each are granted on a competitive basis to undergraduate students.

Double Hoo Awards are intended to encourage collaborative interaction between the University's undergraduate and graduate communities. This year, **Isabella Dressel** and

Mary Angelique Demetillo (graduate student) and **Medha Prakash** and **Marion McKenzie** (graduate student) were selected. The Double Hoo Award is funded by the Robert C. Taylor Fund. Teams receive up to \$6,000.

GRADUATE STUDENTS

Kathryn A. LeCroy was the winner of the Environmental Sciences Student Excellence Award, the department's premier honor. Established by Dr. F. Gordon Tice in 1992, the award was meant to foster environmental research and scholarship and recognizes outstanding undergraduate or graduate students for their contributions to environmental sciences, their ability to communicate their findings, and their efforts to promote a better understanding of the environment.

The department offers a series of awards honoring exceptional graduate students in individual environmental sciences.

Zoe A. Bergman earned the Graduate Award in Ecology, **Kayleigh E. Granville** secured the Graduate Award in Hydrology, **Madelaine A. Miles** won the Graduate Award in Atmospheric Sciences, and **Tyler E. Barnes** earned the Arthur A. Pegau Award in Geoscience. **Rong Li** received the Ellison-Edmundson Award in Interdisciplinary Studies.

Morgan Shelby Tassone 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.

Mary Angelique Demetillo received the Jay Zieman Research Publication Award, named after the late Jay Zieman, long-time chair of the department.

The Exploratory Research Awards, based on merit, were initiated to help selected students conduct preliminary research leading to the development of a thesis or dissertation proposal. The recipients this year were **Kayleigh E. Granville, Jemima Elsherbini, Kylor Kerns,** and **Megan I. McAuliffe**.

Jacob Malcomb received the Thomas Jefferson Conservation Award, which supports basic research related to the conservation of the Earth's resources. Malcomb was also one of 10 students from the Graduate School of Arts and Sciences selected to present their research at the 2021 Husky Graduate Research Symposium.

David A. Crowe won the Michael Garstang Award, which supports graduate student research in interdisciplinary atmospheric sciences.

Marion McKenzie and **Kayleigh E. Granville** won the Graduate Student Association Award, which recognizes members of the department who have been particularly helpful to the graduate student body.

Kelsey S. Huelsman won the Fred Holmsley Moore Teaching Award, which is bestowed on graduate teaching assistants distinguished by their ability to instill excitement, wonder, and confidence in students. An endowment established by Fred H. Moore funds this award, along with matching donations from Mobil Oil Company. Huelsman also was one of just 10 recipients of the 2021 All-University Graduate Teaching Awards, given by the Office of Graduate and Postdoctoral Affairs and the Office of the Provost.

FACULTY

Lawrence Band, Ernest H. Ern Professor, is a member of the Editorial Board of *Hydrological Processes* and represents the University at the Consortium of Universities for the Advancement of Hydrological Science, Inc. (CUAHSI). At the University, he is a member of the Promotion and Tenure Committee in the School of Data Science and chaired the joint Environmental Sciences Department-School of Data Science search for a senior-level environmental data scientist. Professor Band serves on the Faculty Steering Committee for the Environmental Resilience Institute and was a co-organizer of its Water Futures Initiative.

Peter Berg arranged a session on underwater flux measurements at the Association for the Sciences of Limnology and Oceanography Aquatic Sciences Meeting.

Linda Blum is a board member of the National Oceanic and Atmospheric Administration (NOAA) Chesapeake Bay Sentinel Site Cooperative and a member of its Vertical Land Motion Workshop Planning Committee. She is also a member of its Surface Elevation Table Working Group for the Mid-Atlantic Region, also sponsored by NOAA. She is chair of conference art for the Coastal and Estuarine Research Federation's 2021 Conference.

David Carr is an associate editor of the *American Journal of Botany*, a member of the Board of Directors of the Foundation of the State Arboretum, and a member of the Chairs and Directors Committee of the College and Graduate School of Arts & Sciences.

Max Castorani served on the Editorial Board of *Ecosphere* and as an external advisor for the Plum Island Ecosystems Long Term Ecological Research project (PIE LTER). He reviewed grant proposals for the European Research Council and co-authored a policy brief on oyster reef restoration for the National Oceanic and Atmospheric Administration. He was an invited participant to the workshop on the *Future of Synthesis in Ecology and Environmental Science*.

Robert Davis chairs the assembly group of the Processions Committee at the University as well as the Faculty Nominations Committee of the Raven Society.

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). For the American Meteorological Society (AMS), he serves on the Scientific and Technological Activities Commission Committee on Agricultural and Forest Meteorology and represents AMS at the Council for Agricultural Science and Technology. He is also a member of 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 UVA at the University Corporation for Atmospheric Research.

Scott Doney, the Joe D. and Helen J. Kingston Professor in Environmental Change, is a Web of Science Highly Cited Researcher in Environment and Ecology as well as Geosciences. He serves as secretary of the Atmospheric and Hydrospheric Sciences Section at the American Association for the Advancement of Science and as chair of the Committee on a Research Strategy for Ocean Carbon Dioxide Removal and Sequestration at the National Academy of Sciences. 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 Award Subcommittee of the Association for the Sciences of Limnology

and Oceanography. Professor Downy was a consultant on *Revamping Federal Climate Science*, a report published by the Center for American Progress, and also serves on the Editorial Board of *Ocean Science*, a publication of the European Geosciences Union.

In addition, Professor Doney participates in a number of interagency groups. He is a member of the Ocean Carbon Biogeochemistry Scientific Steering Committee (National Science Foundation [NSF] and NOAA), the Climate Observing System Council of the Ocean Observing and Monitoring Division (NOAA), the U.S. Biogeochemical Argo Subcommittee (Ocean Carbon Biogeochemistry, National Aeronautics and Space Administration [NASA], 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 [NCAR], University Corporation for Atmospheric Research [UCAR], and NSF). 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 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. He was the guest editor of a special issue of *Big Earth Data*. At the University, Professor Epstein is codirector of the College Science Scholars program and a lower-division advising fellow in the College of Arts & Sciences. He is a faculty panelist for Days on the Lawn and a judge for the Robert Huskey Graduate Research Award competition.

James N. Galloway, the Sidman P. Poole Professor of Environmental Sciences, is a member of the Steering Committee of the International Nitrogen Initiative as well as the Initiative's North American center. He is also a member of the Planning Committee for the Environmental Health Matters Initiative of the National Academies. 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 and its Academic and Campus Strategy Committees. He is a member of the University Committee on Sustainability, and he was co-chair of its Teaching and Research Subcommittee. He also chaired the committees' Nitrogen Working Group with two student co-chairs, Libby Dukes and Alicia Zheng.

Kevin Grise is review editor for *Frontiers in Climate* and a peer reviewer for 11 journal articles. He represents UVA at UCAR and was a presenter at its meeting in October 2020.

Kyle Haynes is on the Editorial Board of *Ecography* and participated in the University's Inclusive Excellence Initiative.

Janet S. Herman (emerita) is president of the Karst Waters Institute and chairs the Award Committee for its William L. Wilson Scholarship in Karst Science.

Deborah Lawrence directs the Environmental Thought and Practice program, an interdisciplinary major that brings the natural sciences, social sciences, arts, and humanities to bear on understanding and solving environmental challenges like climate change. She is a member of the Climate Strategies Committee of the International Climate Policy Research Group. She also serves on the Trustee Council of The Nature Conservancy and as secretary of its Virginia Chapter. Professor Lawrence co-chairs the Teaching and Research Subcommittee of the University Committee on Sustainability and serves on the Advisory Board of the *Virginia Environmental Law Journal*, which is edited by students at the School of Law.

Manuel Lerdau is an associate editor of *Biology Letters* and a member of the Editorial Board of *Northeastern Naturalist*. He was a guest editor of *Ecological Applications*. He is also a member of the Biogeochemistry Working Group at the National Ecological Observatory Network and the NASA Goddard STELLA

Remote Sensing Team. At the University, Professor Lerdau chairs the College and Graduate School of Arts & Sciences Faculty Rules Committee and the Nelson Fund Committee, is a board member of the Global Infectious Disease Institute, and a member of the Southeast Asia Studies Committee, the Sustainability@UVA initiative, the UVA Food Collaborative Steering Committee, and the Sexual Misconduct Hearings Board. He serves on the Advisory Committee for Directors of Diversity and Inclusion Committee, mentors students working at the Morven Kitchen Garden, and participates in the Grad STAR Faculty Student Mentoring Program.

Ajay Limaye serves on the College and Graduate School of Arts & Sciences Quality Enhancement Plan Advisory Committee and the department's Seminar, Undergraduate Academic Requirements, and Diversity, Equity and Inclusion Committees.

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 (Biogeosciences)*, and a member of the Editorial Board of *Minerals*. He is on the Advisory Board of the Oxford Research Encyclopedias: Environmental Science and the Major Instrumentation Panel at the National Science Foundation. At the University, Professor Macko is a member of the Faculty Senate, the Faculty Advisory Committee, the Provost's Academic Strategy and Policy Review Committees, the Summer Session Advisory Committee, the Committee on Sustainability, and the University Libraries Committee. He also serves as a judge for the University's Double Hoo Competition and the Harrison Awards Competition, the Virginia Space Grant Competition, and the Huskey Graduate Research Award and is a Hereford College Faculty Fellow. He is a promotion and tenure reviewer for the University of Maryland.

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 Executive Board as well as 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*. She also participates in a number of organizations in the Commonwealth and serves on Gov. Ralph Northam's Technical Advisory Committee for Virginia's Coastal Resilience Master Plan, the Governor's Carbon Sequestration Task Force, and on the Research and Education Advisory Council of Virginia Sea Grant. She is the UVA representative to the Association of Public and Land-Grant University's Board on Oceans, Atmosphere, and Climate.

At the University, Professor McGlathery is director of the Environmental Resilience Institute, co-director of the Coastal Future Conservatory, co-director of the Teaching and Research Subcommittee of the UVA Committee for Sustainability, a member of President James Ryan's Morven Farm Working Group, and an advisor to UVA's Yamuna River Project. She is a senior fellow of the College of Arts & Sciences Society of Fellows.

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's Assessment Advisory, its Institutional Review Entity, and its Institutional Biosafety Committees.

Michael Pace is president of the Association for the Science of Limnology and Oceanography. He was guest editor of a special issue of *Limnology and Oceanography*.

John Porter is chair of the Controlled Vocabulary Working Group of the LTER Information Management Committee

Sally Pusede received two prestigious research awards this year: the NASA New Investigator Award and the NSF CAREER Award. Professor Pusede is a co-editor of *Atmospheric Chemistry and Physics* and a convener for Biosphere-Atmosphere Interactions and Atmospheric Chemistry session at the American Geophysical Union fall meeting. At the University, she is one of four co-directors of the Repair Lab, part of the University's Democracy Initiative, a founding member of Intersections of Urban Inequality, and a member of the grant selection committee of the Center for Global Inquiry and Innovation. This year, the department awarded her its Tice Prize for research excellence.

Carleton Ray was named a Conservation Legend by the Bahamas National Trust for leading the effort to create the Exuma Cays Land and Sea Park. He is on the Editorial Board of *Aquatic Conservation: Marine and Freshwater Ecosystems* and serves on the Advisory Board of the Ocean Foundation.

Matthew Reidenbach is an associate editor of *Frontiers in Marine Science*. He was a member of the Physics Chair Search Committee and directs the department's Diversity, Equity, and Inclusion Committee.

T'ai Roulston is a subject editor of *Ecosphere* and was a member of the Working Group crafting a recovery plan for the newly listed endangered species *Bombus affinis*, the rusty-patched bumble bee.

Todd Scanlon serves as vice chair of the Science Advisory Committee of the Rivanna Conservation Alliance's Shenandoah National Park Science Team. He is a member of the College and Graduate School of Arts & Sciences Committee on Faculty Rules and is a reviewer for the Harrison Undergraduate Research Award program.

Kathleen Schiro is an associate editor of *Monthly Weather Review*.

Herman H. Shugart, the W. W. Corcoran Professor of Environmental Sciences, Emeritus, is a member of the International Council of the Siberian Federal University and a U.S. observer and member of the BIOMASS Mission Assessment Group of the European Space Agency. He is editor-in-chief of Oxford Research Encyclopedias: Environmental Science and a member of the Editorial Boards of *Ecological Processes*, *Forests*, *Forest Ecosystems*, and *The Sejm Review*.

Lauren Simkins is a member of the West Antarctic Ice Sheet Workshop organizing committee and a program coordinator for its Early Career Mentoring Program. She is on the Books Editorial Committee of the Geological Society of London, serves as a judge for the American Geophysical Union Outstanding Student Presentation Awards, and sits on the Review Panel for the National Science Foundation's Polar Programs. She is also a member of the Louis Stokes Alliance for Minority Participation (LSAMP) Virginia-North Carolina Alliance Governing Board. She serves as a mentor for the LSAMP Bridge to Doctorate program and for the Mentoring Institute of the Office of Graduate and Postdoctoral Diversity Affairs.

David E. Smith serves on the University's Facilities Management Advisory Board and the Athletics Advisory Council.

Patricia Wiberg was elected a Fellow of the American Association for the Advancement of Science. She serves on the Executive Committee of the American Geophysical Union's Earth and Planetary Surface Processes Focus Group and is an associate editor of *ESurf* and a member of the editorial committee of the *Annual Review of Marine Science*. In addition, Professor Wiberg 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 of Arts & Sciences as well as the Graduate Education Committee of the 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 FluxCourse, a two-week educational program for graduate students sponsored by the AmeriFlux Network. This year, the department awarded him its Tice Prize for research excellence.

PEER-REVIEWED PAPERS, BOOK CHAPTERS, AND BOOKS

(Summer 2020 through Spring 2021)

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- Berg, P.**, **Pace, M. L.**, & **Buelo, C. D.** (2020). Air–water gas exchange in lakes and reservoirs measured from a moving platform by underwater eddy covariance. *Limnology and Oceanography: Methods*, 18(8), 424–436. <https://doi.org/10.1002/lom3.10373>
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UVA DEPARTMENT OF ENVIRONMENTAL SCIENCES MISSION STATEMENT

OUR MISSION

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

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



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