



2017 ANNUAL REPORT



The University of Maryland Center for Environmental Science is an independent and globally eminent research and educational institution aimed at advancing scientific knowledge of the environment.



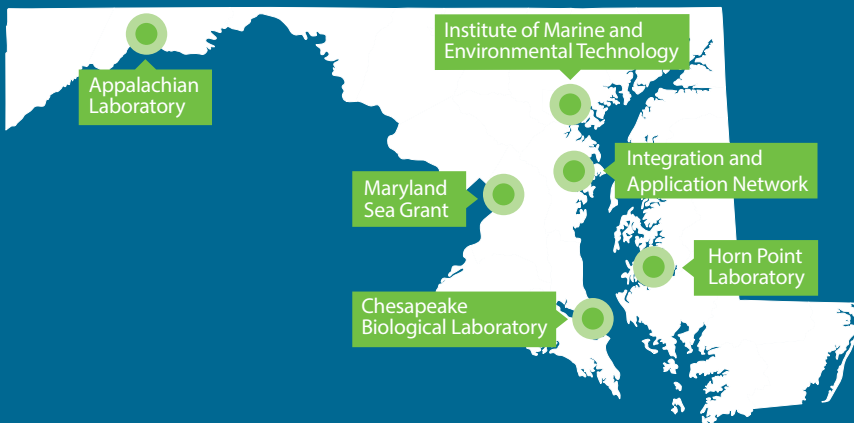
As trusted scientific advisors, our faculty provide unbiased research to inform management decisions and public policy on pressing environmental issues in our local communities and around the globe.



We work across disciplines and in diverse settings—from the Appalachian Mountains to the Arctic—seeking solutions that improve people’s lives and sustain the natural world.



Our renowned faculty train the next generation of environmental leaders as part of the University System of Maryland’s nationally ranked graduate program in marine and environmental science.



Headquarters: Cambridge, Maryland
Year founded: 1925
Faculty members: 70
Graduate students: 85
Research laboratories: 4

HARNESSING THE POWER OF SCIENCE TO TRANSFORM THE WAY SOCIETY UNDERSTANDS AND MANAGES THE ENVIRONMENT

MESSAGE FROM THE PRESIDENT

It was a privilege to take the reins as president of the University of Maryland Center for Environmental Science this past September. It is great to be part of this esteemed and long-serving organization, and I appreciate the warm welcome I've received from our collaborators across academia, agencies, and the broader community.



UMCES Board of Visitors Chair Charlie Monk welcomes Dr. Peter Goodwin as president.

These first few months have reinforced the uniqueness of UMCES—an independent institution committed to “harnessing the power of science to transform the way society understands and manages the environment.” We do the environment, period. Our duty to the State of Maryland is to develop science that is relevant, credible, and transparent to help inform management decisions and policies that have to be made in the coming decades.

This tradition to ensure the integrity of the Maryland environment for future generations has been fostered and expanded by my predecessor, Dr. Donald Boesch. It has impressed me deeply that when our researchers, whether students or faculty, are asked about their activities, they will not only describe their fundamental

research but also will share its context and practical application. Scientists at each of the four laboratories, Integration and Application Network (IAN), and Maryland Sea Grant are making major contributions to solutions not only in Maryland but around the nation and the world.

I am excited to see how we can expand and enhance our service to the people of Maryland and continue to support significant progress that has been made on the Chesapeake Bay, ensuring that the policies, committed resources, and assessments that guide implementation of best management practices continue. I am also very excited to see how we can partner with colleagues throughout the United States and the world to increase our impact and relevance to address some of the grand challenges facing the global environment.

We have the opportunity to scale up our expertise to tackle some of the bigger and more difficult challenges related to the environment, all the while preparing the future professional workforce through our newly structured Marine Estuarine Environmental Sciences graduate program.

I look forward to working with you all to chart these future directions in 2018.

Respectfully,

Dr. Peter Goodwin
President

MISSION: The University of Maryland Center for Environmental Science has a unique statutory mandate to conduct a comprehensive scientific program to develop and apply predictive ecology for the improvement and preservation of Maryland's physical environment. This mission is accomplished through research, education, and public service.

YEAR IN REVIEW

A snapshot of news and research from our laboratories across the state



Bill Dennison, Vice President for Science Applications, received the first-ever **Margaret A. Davidson Award for Stewardship** from the Coastal and Estuarine Research Federation for contributions to the estuarine scientific community. The award honored him for his trailblazing work to synthesize scientific results in a way that aids public awareness and management decisions.



Laura Lapham, associate professor at Chesapeake Biological Laboratory, was awarded one of ten **Changing the Face of STEM** mentoring grants from the L'Oréal USA For Women in Science program to inspire the next generation of girls in science, technology, engineering, and math. The grant supports a hands-on research experience to encourage

students at the College of Southern Maryland to pursue careers in marine sciences.



Professor **Rose Jagus** of the Institute of Marine and Environmental Science was awarded the **Wilson H. Elkins Professorship** by the University System of Maryland for her contributions to increasing the diversity of scientists working in the marine sciences. She is the director of the Living Marine Resources Cooperative Science Center's summer undergraduate internship program.

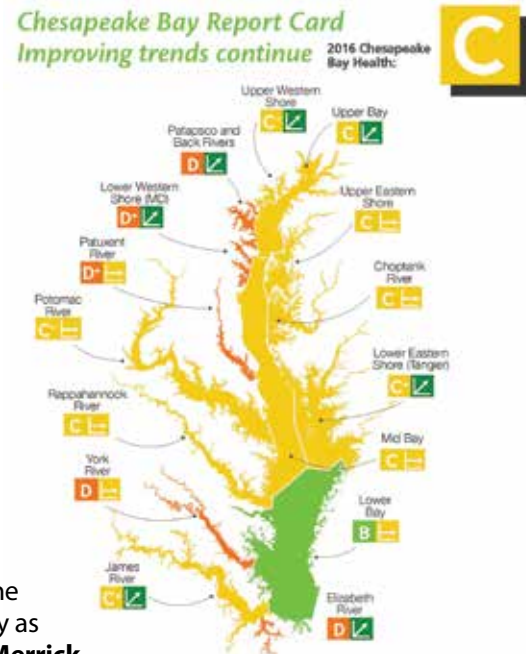


At the fourth annual **commencement**, students were charged to "solve the unsolvable and shape the future." Nine students participated in the ceremony at the Appalachian Laboratory, and a total 18 students earned their doctorate or master's degrees in 2016-2017.



Mario Tamburri, research professor at the Chesapeake Biological Laboratory and director of the Alliance for Coastal Technologies and the Maritime Environmental Resource Center, received a University System of Maryland **Regents' Faculty Award for Excellence in Public Service**. An expert in coastal observing systems, he was recognized for applying innovative and environmental sensor technologies to monitor water quality and working to reduce the risk of invasive species through maritime transportation.

The largest estuary in the nation scored a C grade in the **2016 Chesapeake Bay Report Card**, one of the highest scores calculated by scientists at UMCES' Integration and Application Network. Overall health remained steady despite many pressures on the Chesapeake Bay and across its watershed.



Kenny Rose joined the Horn Point Laboratory as UMCES' first **France-Merrick Foundation Professor** in Sustainable Ecosystem Restoration. The endowed professorship was established to maintain Maryland's leadership in restoring ecosystems, including the nation's largest and most important estuary, the Chesapeake Bay, in the face of growth and a changing climate.



Cat Styliniski of the Appalachian Laboratory received the **President's Award** for environmental education and fostering connections between scientists and non-scientists. She was lauded for getting citizens involved in science and using that experience to promote new ways to be more effective in public outreach and in teaching.



RESEARCH HIGHLIGHTS



Discovering the keys to evolution in genes of tiny creatures

A group of scientists including the Institute of Marine and Environmental Technology's **TSVETAN BACHVAROFF** have used new genetic sequencing data to understand how an ancient organism that lived alongside the dinosaurs has evolved over millions of years. A four-year effort uncovered for the first time the biology and evolution of dinoflagellates, tiny but complex organisms primarily known as marine plankton. The findings could lead to a better understanding of how

bioluminescence works or how to identify areas rich with oil by looking at fossilized dinoflagellates in the rock.

"Now we understand how they are related, what they look like. It's their genomic flexibility that has given them the advantage to evolve," said Bachvaroff.

Working locally, thinking globally

The Appalachian Laboratory's **XIN ZHANG** and **ERIC DAVIDSON** are leading an international effort to help countries gain better insight into their environmental footprint. They have been working to build a sustainable agriculture matrix as part of the United Nations' Sustainable Development Goals, a universal grading system to help countries measure how they balance fertilizer use and meet a growing demand for food.

"It's remarkable that we—from Appalachian Laboratory, from University of Maryland Center for Environmental Science—have been able to take a leadership role in something related to global agriculture," Davidson said. "I think it shows we are thinking at all scales, including thinking big."

Dolphin Watch project invites citizen scientists to collect data

This summer, the Chesapeake Biological Laboratory's **HELEN BAILEY** invited everyone who spends time on or near the Chesapeake Bay to report dolphin sightings with a new online tracking system. Chesapeake DolphinWatch allows users to mark the location on a map of the Chesapeake and its tributaries so scientists can better understand where the dolphins are and where they go. Between June and September, the app received more than 900 reported sightings from 1,500 users.

"We'd like to increase people's awareness of the dolphins and collect data at the same time," said Bailey. "The more eyes we have on the water the better to report dolphin sightings."

First gene-based ocean model suggests it's not who you are but what you do

Horn Point Laboratory's **VICTORIA COLES** and her team have developed a new tool that advances our understanding of how tiny microbes maintain complex ocean chemistry. The new model simulates the impact of microbial activities on the chemistry in the North Atlantic and is the first model that actually predicts genes and transcription throughout the ocean.

"The model suggests that it's not the evolution of species but rather the evolution of microbial metabolisms that sets our present-day ocean chemistry," said Coles.



Meet the President: DR. PETER GOODWIN

In September, Dr. Peter Goodwin joined the University of Maryland Center for Environmental Science as its sixth chief executive, building on more than 90 years of advancing knowledge of the environment and educating the next generation of scientific leaders. From the President's Office at the headquarters overlooking the Choptank River in Cambridge, Maryland, Dr. Goodwin shares more about himself and his vision for the future.



What brings you to the University of Maryland Center for Environmental Science?

The University of Maryland Center for Environmental Science is really unique as an independent institution totally focused on the environment and graduate education. The diversity and depth of research activities surrounding the environment allows this institution to be uniquely poised to take on many of the grand challenges in sustaining a desirable and resilient environment for future generations. The national and global reputation of the work done here is quite extraordinary.

Two weeks before I started, I was at an international conference in Asia, and one of the keynote speakers called out the University of Maryland Center for Environmental Science as making perhaps the largest single contribution by an institution of scientific advances in the estuarine and ocean sciences. That's quite a reputation.

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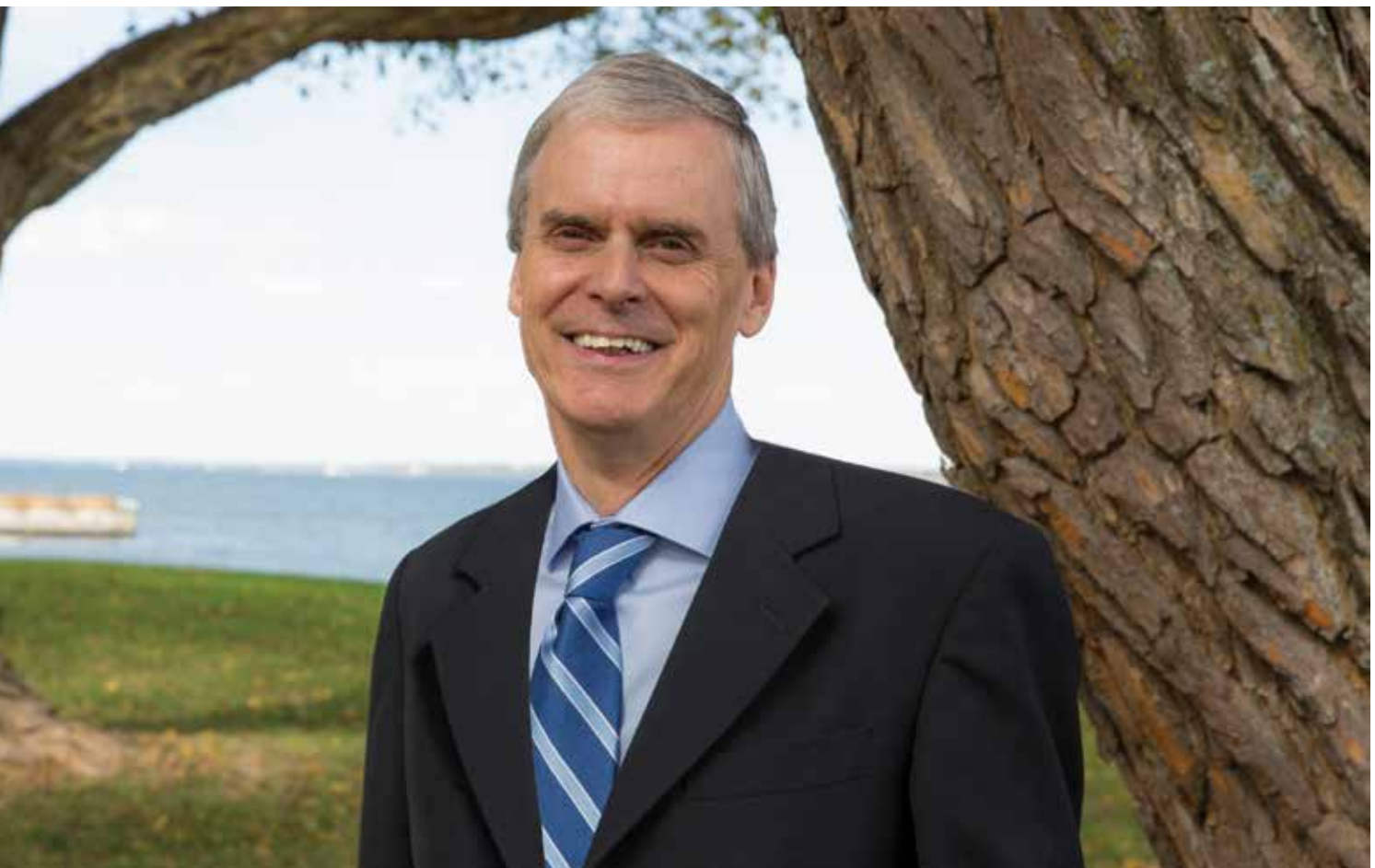
I also knew a lot about the contribution of many of the faculty here. It is a long list of individuals that are known internationally for their research activities.

You have decades of experience bringing together scientists and communities to collaborate on science. Could you tell us more about your work?

I have been working on ecosystem restoration, ecohydraulics, and the enhancement of river, wetland, and estuarine systems for more than 30 years, from Chile to Asia, and from the Delaware Bay to California.

I am the founding director of the Center for Ecohydraulics Research at the University of Idaho, an interdisciplinary group working on the simulation of ecological response to management actions or changes in physical processes of rivers, lakes, estuaries and wetlands. I recently served a federal appointment in California as the lead scientist for the Delta Science Program to support mandated goals of water supply reliability and ecosystem recovery, thinking through how do you bring all of the various interests and researchers together to pursue a common science agenda.

I'm also heavily involved with a group called International Association for Hydro-Environment Engineering and Research, which is the oldest international research association on water research in the world. In that organization, we try and structure research knowledge around engineering and science to inform large-scale water management projects, global water security, and sustainability development goals.



What are some of the challenges that we are facing in the environment today?

I think the first issue is ensuring that our society and our communities understand how lives can be altered in the coming decades as a result of how we manage—or not manage—our environment today to ensure that decisions that guide these alternative futures reflect what society would like to see in the short term and for future generations. In our ecosystems we are approaching thresholds where there will be irreversible change.

Structuring science to inform policy and management actions, as well as informing communities of likely outcomes, is extremely important.

Can we anticipate these kinds of events, and what are the consequences if we do pass these tipping points? Moving toward these critical points could be caused by many different things. It could be impacts from climate change, a new invasive species into the system, emerging contaminants affecting water quality, population pressures on existing infrastructure, or development. Structuring science to inform policy and management actions, as well as informing communities of likely outcomes, is extremely important.

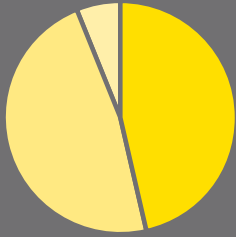
How can science make a difference?

Science around environmental issues is complex. Look at the challenge of how we manage sea level rise to sustain tidal wetlands. How do we restore wetlands in a way that maintains all the benefits they provide, from reducing flood risks to carbon sequestration? Ensuring that those tidal wetlands retain the ecological value that they have today is going to be a challenge because when you start contemplating restoration on a landscape scale, there's going to be unintended consequences that need to be anticipated, such as release of toxic materials. There needs to be flexibility in how we undertake those restoration activities to account for these changes.

So developing the science to understand this evolution, to get ahead of the curve and anticipate what could be done to minimize unintended consequences, to maximize benefits that everybody had agreed to when this project was conceived requires a long-term commitment of researchers and resources, as well as the ability to change strategy as we understand how the system evolves. Local communities also need to have a say in the outcome, as well as businesses and industry that could be affected by those decisions. ♦

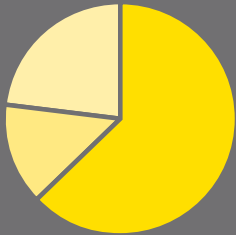
2017 FINANCIALS

Sources of Revenue



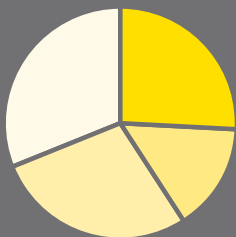
- State Appropriations: 46%
 - Grants: 47%
 - Other: 6%
- \$49.3 million**

Sources of Grants



- Federal: 63%
 - State: 14%
 - Private: 23%
- \$23.5 million**

Sources of Federal Grants



- National Oceanic and Atmospheric Administration: 26%
 - Environmental Protection Agency: 15%
 - National Science Foundation: 28%
 - Other: 31%
- \$15.1 million**

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Graduate student **Amanda Lawrence** is working to identify a male-specific hormone that indicates maturity in crabs to help fisheries management make decisions about size limits.

"I am studying at the Institute of Marine and Environmental Technology because of the innovative opportunities here. The aquaculture research center produces its own artificial sea water and allows me to raise and work with blue crab year-round."



Blake Clark uses 3D biogeochemical modeling to understand the role of dissolved organic matter in coastal carbon cycling.

“I came to Horn Point because of the opportunity to work in a cutting-edge laboratory under my advisor, Raleigh Hood, and the strong interdisciplinary research at UMCES. I plan to stay in academia pursuing a career in higher education and research in oceanography and environmental chemistry.”

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Stephanie Siemek works in the Chesapeake Bay watershed to evaluate how effective riparian buffers—vegetated areas near streams that help shade and protect those

streams—are in reducing nutrients in groundwater before being discharged into streams.

“My plans are to find a job in environmental management or restoration with a focus on water quality.”

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Graduate student **Katie Martin** is developing a method to identify what amount of nitrogen in waterways comes from septic wastewater, one of many sources of nitrogen that flow into the Chesapeake Bay.

"I knew I wanted to study water contamination in graduate school. I love that I am now working on a project so relevant to public and environmental health."

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Faculty Senate Chair Dave Secor congratulates Don Boesch for his 27 years of environmental leadership at an event to honor the outgoing University of Maryland Center for Environmental Science president. Boesch now serves as a faculty member working on research and publications.



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