

# UNIVERSITY OF MARYLAND CENTER FOR ENVIRONMENTAL SCIENCE



2015  
ANNUAL  
REPORT



*Innovation for a better future*



University of Maryland  
CENTER FOR ENVIRONMENTAL SCIENCE

For 90 years, the University of Maryland Center for Environmental Science has led the way toward better management of Maryland's natural resources and restoration of the Chesapeake Bay. UMCES scientists provide sound advice to help state and national leaders manage the environment and prepare future scientists to meet the global challenges of the 20<sup>th</sup> century.



Above: UMCES founder Reginald Truitt at work at the Chesapeake Biological Laboratory.

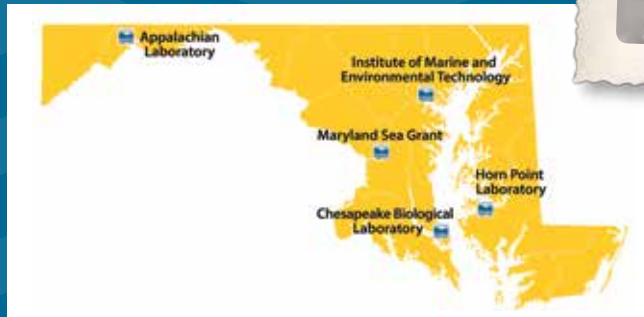


Top right: Graduate student Lori Staver surveys marshes on the Eastern Shore.

Right: David Nelson measures leaf chemistry with student Vanessa Cunningham in western Maryland.



Far right: The next generation of scientists studying crabs in the 1960s.



# MESSAGE FROM THE PRESIDENT

For 90 years, the University of Maryland Center for Environmental Science has had a profound impact by making key discoveries and expanding broader understanding of our environment—and engaging with society and its government agencies to apply that knowledge to environmental protection and sustainable use of our natural resources.



President Donald Boesch

As the leading scientific institution focused on the Chesapeake Bay and its watershed, our scientists have a legacy of pioneering research and deep understanding that can inform how communities around the world restore degraded coastal ecosystems and polluted waterways.

UMCES science has directly improved the Bay's health by reducing nitrogen, phosphorous, and sediment pollution. It has empowered stream restoration and expanded key habitats such as riparian forests, seagrass beds, and oyster reefs. And, it is helping to sustain populations of striped bass and blue crabs for recreational and commercial uses.

It is a pivotal time for UMCES as emerging challenges, such as climate change, are affecting our environment. Like the globe as a whole, Maryland and the Chesapeake Bay are getting warmer and local sea levels are rising. UMCES is leading the effort to understand the regional impacts of a warming world on key environments, water resources, forests, fisheries, and risks of flooding.

Through continued innovation, UMCES scientists are at the forefront of understanding the links across the continuum of mountains to the sea. At its core, our research, education, and societal engagement significantly informs actions that can be taken to sustain our region's quality of life for generations yet to come. We invite you join us in this effort.

A handwritten signature in black ink that reads "Donald F. Boesch". The signature is written in a cursive, flowing style.

**Dr. Donald F. Boesch**  
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.

# LOOKING TO THE PAST—AND FUTURE— TO UNDERSTAND A CHANGING CLIMATE

Since its founding, the University of Maryland Center for Environmental Science's work has led to groundbreaking discoveries that have changed the way we think about our environment. The pace continues today as cutting-edge research focuses on important issues—from turning algae into biofuel to predicting the impact of climate change—to provide a scientific foundation key to planning for our state and nation's future.

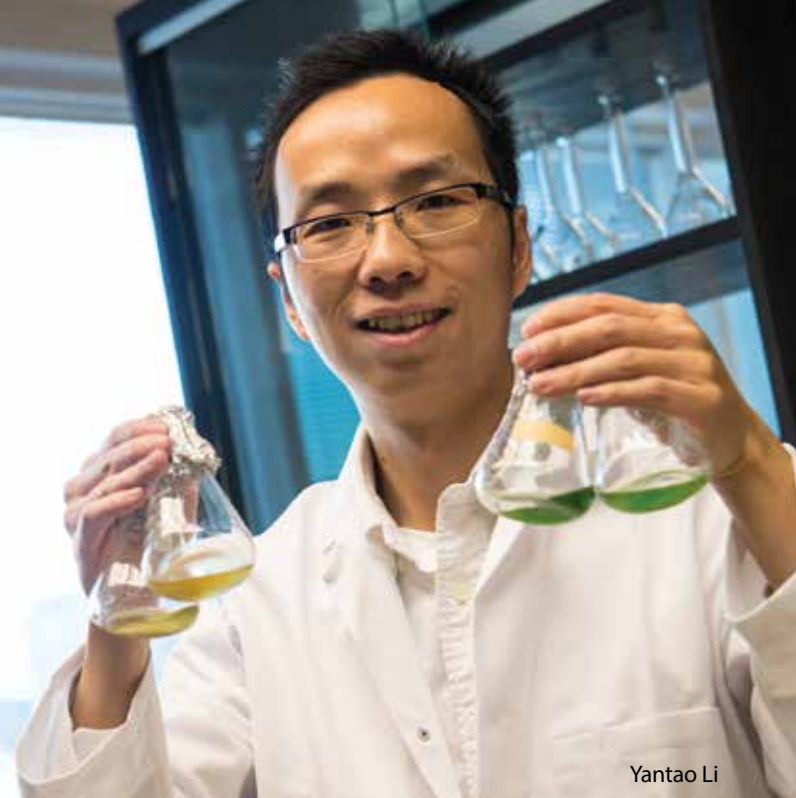
## ► By land or sea: Improving water quality and quality of life

Nitrogen fertilizers make it possible to feed more people in the world than ever before. However, too much of it can also harm the environment. **Eric Davidson** of the Appalachian Laboratory has been leading a national group of scientists, economists, sociologists, and agriculture experts in figuring out how to produce more abundant and nutritious food while minimizing pollution and giving farmers a chance to make a living. He calls it "Mo Fo Lo Po": more food, low pollution. In Maryland, **Tom Fisher** of the Horn Point Laboratory is working directly with farmers and residents on the Eastern Shore to measure the impacts of best management practices like cover crops and stream buffers on water quality. The People Land Water project is a five-year study meant to determine the effectiveness of such practices on agricultural and residential properties.



Eric Davidson





Yantao Li

### ▲ Exploring advances in alternative energy

UMCES scientists are leading the way in studying the impacts of energy sources on our environment. **Ed Gates** at the Appalachian Laboratory is monitoring how wind turbines in the mountains of Western Maryland are affecting bats and birds. **Helen Bailey** of the Chesapeake Biological Laboratory is using underwater microphones to figure out when whales, seals, and dolphins are traveling along the Atlantic coast to recommend the best times to construct wind farms to minimize impact on marine life. In the laboratory, **Yantao Li** is working with colleagues at the Institute of Marine and Environmental Technology to make the development of biofuel more efficient by identifying an oil-abundant strain of algae and perfecting an economical method to extract it for use.

Hali Kilbourne



### ▼ Keeping the Maryland in crabs, inside and out

Declines in the Chesapeake Bay blue crab stocks led Maryland to search for scientific answers and effective management responses in the mid 1990s. **Tom Miller** of the Chesapeake Biological Laboratory played a leading role in examining the condition of the Bay's blue crab population through laboratory, field, and modeling approaches, setting in motion actions that dramatically changed our understanding of blue crab population dynamics and led to successful Bay-wide changes in management. Today, **Sook Chung** at the Institute of Marine and Environmental Technology is looking at crabs from the inside out, examining how their genes and hormones impact how they reproduce and survive, potentially impacting a healthy stock in the future.



### ◀ Understand a changing climate

To understand how our climate is changing today and what could happen in the future, scientists like paleoclimatologist **Hali Kilbourne** at the Chesapeake Biological Laboratory turn to natural archives such as ancient corals to see how the Earth's climate has changed in the past. Corals keep a climate record in their fossilized skeletons that can be plugged into a model to help predict changes in the future. Meanwhile, **Matt Fitzpatrick** and his colleagues at the Appalachian Laboratory are taking a step into the future by peering into the genetic blueprint of living trees, and combining new modeling approaches with satellite imagery, to make predictions about how species will react to a quickly changing climate.

# YEAR IN REVIEW

“HAD IT NOT BEEN FOR UMCES’ BANKS OF DATA, PROOF, AND EVIDENCE, THE BAY WOULD’VE DIED 20 YEARS AGO.”

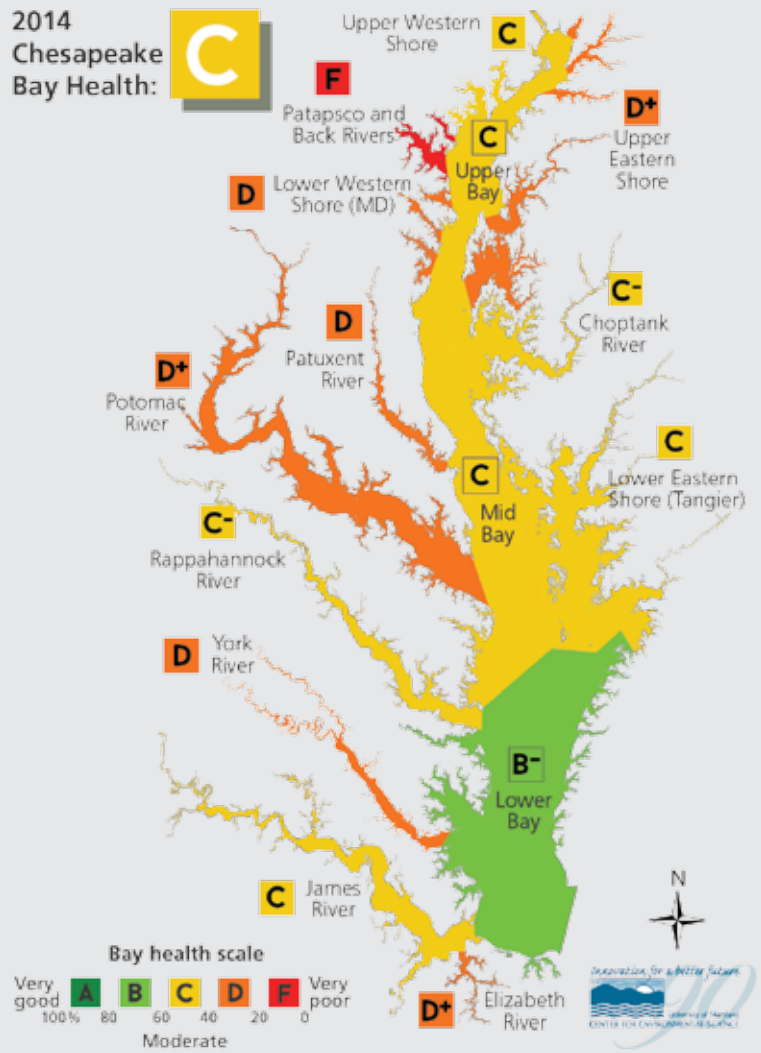
—Former Maryland Senator and environmental activist Bernie Fowler



UMCES celebrated its **90<sup>th</sup> anniversary** this fall at an event that drew close to 200 Maryland policymakers, supporters, and friends. Those who lauded UMCES for its commitment to better management of Maryland’s natural resources and the protection and restoration of the Chesapeake Bay included Senator **Ben Cardin**, former Maryland Senator **Bernie Fowler**, former Maryland Governor **Harry Hughes**, and Maryland Cabinet Secretaries **Mark Belton** and **Ben Grumbles**.

**Chesapeake Bay improved** in 2014 with significantly improving trends in total nitrogen and total phosphorus in the Bay. Overall, the tidal waters scored a ‘C,’ or moderate health. “Our investments in nutrient reduction over the last 20 years are reflected in Bay health,” said Bill Dennison, Vice President for Science Applications. “I am convinced that these positive trends indicate we are beginning to make a real difference in Bay health through our combined actions.”

## 2014 Chesapeake Bay Health Index



A pioneer in the migration ecology of coastal fishes, **David Secor** explains in his new book how an explosion of digital-age technologies in the last four decades has allowed fisheries scientists to observe the underwater lives of fish in a whole new way. *Migration Ecology of Marine Fishes* was published by Johns Hopkins University Press.



An expert in coastal observing systems, **Mario Tamburri** of Chesapeake Biological Laboratory was honored with the **President's Award for Excellence in Application of Science** for his leadership in applying innovative environmental sensor technologies and working to reduce the risk of invasive species through maritime transportation. **The overall health of**



Maryland blue crab expert **Tom Miller** received the 2015 **USM Regents' Faculty Award for Public Service**, the highest honor that the Board bestows to recognize exemplary faculty achievement. Miller has been at the epicenter of advancing scientifically informed decision-making leading to the sustainable use of marine resources, particularly the iconic Chesapeake Bay blue crab, while educating the next generation of environmental scientists.

# RESEARCH HIGHLIGHTS

## Pollution control policies effective in improving downwind air quality



Emissions controls on coal-fired power plants are making a difference in reducing exposure of mercury to people, especially in western Maryland. A study of air quality at the Appalachian Laboratory found that levels of mercury in the air from power plant emissions

dropped more than half over a 10-year period, coinciding with stricter pollution controls.

"I was surprised when I first saw it," said **Mark Castro**. "We've been measuring mercury for years. To see such a dramatic drop was exciting."



## Bacteria in marine sponges harvest phosphorus for the reef community

Scientists have known for years that sponges can filter water and gather nutrients from the ocean, making it appear crystal clear. For the first time researchers at the Institute of Marine and Environmental Technology have identified that bacteria on sponges are harvesting phosphorus from the water for the reef ecosystem to use for nourishment.

"Coral reefs are under huge threat around the world, so we need to understand reef systems very well," said **Russell Hill**. "This is an important step forward in understanding how you can have such incredible biodiversity even though the surrounding water is low in phosphorus."



## Nutrient Challenge aims to improve monitoring technologies

The White House Office of Science and Technology Policy recognized efforts by the Alliance for Coastal Technologies (ACT), based at the Chesapeake Biological Laboratory, in accelerating the development and use of affordable, reliable, and accurate nutrient sensors through its national Nutrient Sensor Challenge.

"Nutrient pollution is the biggest cross-cutting environmental problem, and our inability to make measurements of nutrients in the water—technology is currently too expensive and hard to use—is the biggest limitation to solving that problem," said ACT Executive Director **Mario Tamburri**.

## Study shows harmful algal blooms in Chesapeake Bay are more frequent

A study of harmful algal blooms in the Chesapeake Bay and its tributaries showed a marked increase in the past 20 years. While algal blooms have long been of concern, this study from the Horn Point Laboratory is the first to document their increased frequency in the Bay and is a warning that more work is needed to reduce nutrient pollution entering the Bay's waters.



"We need to pay more attention to reducing nitrogen. We've made some progress but still have efforts to go," said **Pat Glibert**.

# COMMENCEMENT 2015



The University of Maryland Center for Environmental Science's second annual Commencement ceremony was held on May 1 in Annapolis. It featured **Holly A. Bamford '02**, Acting Assistant Secretary for Conservation and Management for the National Oceanic and Atmospheric Administration, as keynote speaker. She told graduates to "take the leap" toward challenges that will come. More than 80 graduate students are currently pursuing M.S. and Ph.D. degrees under the direction of UMCES faculty.

## WE CONGRATULATE UMCES' 2015 GRADUATES:

DOCTOR OF PHILOSOPHY: **Javier Alvarez** (Dr. J. Sook Chung, IMET) • **Jennifer A. Bosch** (Dr. Michael Kemp, HPL) • **Jeanette Davis** (Dr. Russell Hill, IMET) • **Kathleen Gillespie** (Dr. Rose Jagus, IMET) • **David Kazyak** (Dr. Robert Hilderbrand, AL) • **Chieh-Lun Liu** (Drs. Rosemary Jagus/Allen Place, IMET) • **Ryan Powell** (Dr. Russell Hill, IMET) • **Kimberly Vest-Gardner** (Dr. Andrew Elmore, AL) • **Fan Zhang** (Dr. Russell Hill, IMET)

MASTER OF SCIENCE: **Katherine Bentley** (Dr. Patricia Glibert, HPL) • **Virginia M. Clark** (Dr. Matthew Fitzpatrick, AL) • **Emily Flowers** (Dr. Eric Schott, IMET) • **Jia Gao** (Dr. Lawrence Sanford, HPL) • **John Gardner** (Dr. Thomas Fisher, HPL) • **Lauren Gelesh** (Dr. Laura Lapham, CBL) • **Miriam Johnston** (Dr. Matthew Fitzpatrick, AL) • **Anthony Kaufman** (Dr. Thomas Miller, CBL) • **Andrew Keppel** (Dr. Elizabeth North, HPL) • **Cortney Pylant** (Drs. David Nelson and Steven Keller, AL) • **Jason Spires** (Dr. Elizabeth North, HPL) • **Andrea Sylvia** (Dr. Michael Wilberg, CBL) • **Yuanyuan Xu** (Dr. Hali Kilbourne, CBL)



**DID YOU KNOW?** Congress recently passed IRA legislation that allows donors 70½ years or older to transfer up to \$100,000 to charity directly from your IRA savings each year as a tax-exempt distribution. This is retroactive to January 1, 2015, and it has no expiration date. If you made a gift directly from your IRA to UMCES at any point during 2015, or in the future, your contribution will qualify as a rollover gift.

Thanks for considering a gift of IRA shares to UMCES! Contact David Balcom at 410-234-8857 or [dbalcom@umces.edu](mailto:dbalcom@umces.edu) for details.



# CONTRIBUTORS

We sincerely thank our many donors.  
Every gift is important and greatly appreciated.



AES Warrior Run, Inc.  
Mr. Gary Ajemian  
Akridge Family Foundation  
Mr. Ted Alexander  
Allegany College of Maryland  
Ms. Elizabeth Allen  
Mr. Mike Allen  
Mr. Paul J. Allen  
Alliance Coal, LLC/Mettiki Coal, LLC  
Mr. and Mrs. Thomas T. Alspach  
Mr. Chris G. Anderson  
Dr. Robert S. Anderson  
Anonymous (8)  
Mr. and Mrs. Bruce C. Armistead  
Atlantic Concrete Co., Inc.  
Mr. Daniel Avis  
Aycó Charitable Foundation  
Dr. Tsvetan R. Bachvaroff  
Bahri  
Mr. J. Malcolm Bahrenburg  
Bailey Wildlife Foundation  
Ms. Jane Bailey  
Mr. and Mrs. William H. Bailey  
Mrs. Pamela K. Baker  
Mr. and Mrs. Russell Baker  
Mr. David A. Balcom and  
Ms. Laura Gwinn-Balcom  
Mr. and Mrs. Stephen W. Balinski  
Mr. and Mrs. John N. Bambaucus  
Ms. Becky J. Barney  
Mr. Clay E. Baros  
Ms. Joy A. Bartholomew  
Mr. David J. Bates  
Mr. and Mrs. Jack Batty  
Jamie Lisa Moss and Jamie Baum  
Bay Instruments, LLC  
Ms. Marguerite Vermilye Beebe  
Mr. and Mrs. Carl Belt, Jr.  
Mr. Gabe Beltran  
Mr. and Mrs. J. Hunter Bennett  
Mr. and Mrs. Richard Bernstein

Mrs. Leslie E. Beveridge  
Ms. Hongyan Bi  
Dr. Honsheng Bi  
Mr. Jay Bilas and Ms. Wendy Johnson Bilas  
Ms. Eileen C. Billinson  
Drs. Carol Bird and Earl C. Ravenal  
Mr. and Mrs. William J. Bishop  
Mr. and Mrs. Neal W. Blizzard  
Mr. and Mrs. Richard J. Bodorff  
Dr. and Mrs. Donald F. Boesch  
Dr. William C. Boicourt  
Dr. and Mrs. John P. Borneman  
Mr. and Mrs. Thomas Hale Boggs, Jr.  
Dr. John P. Borneman  
Mr. and Mrs. Gregory Boss  
Ms. Barbara Boyd  
Mr. and Mrs. William B. Boyd  
Mr. Ronald C. Boyer  
Dr. Walter R. Boynton  
Mr. Wayne N. Bradley  
Mr. Jeffrey H. Brainard  
Mr. Kenneth L. Braitman  
Ms. Cleo P. Braver and Mr. Alfred Tyler, II  
Ms. Rachel Brazell  
Dr. Ann R. Bristow Braitman  
Bristol Realty Corporation  
Dr. and Mrs. Harold Britt  
Mr. and Mrs. Gaylord Brooks, III  
Brown Advisory  
Mr. Blaise J. Brown  
Mrs. Patricia A. Brown  
Ms. Shannon Brown  
Mr. Walter R. Brown  
Mr. and Mrs. Thomas L. Buckmaster  
C. Albert Matthews Inc.  
Mr. Henry Cabaniss  
Dr. Craig W. Caldwell  
Calvert Cliffs Nuclear Power Plant LLC  
Ms. Barbara Cammarata  
Mr. D. Keith Campbell  
Mr. and Mrs. James S. Campbell  
Ms. Gail D. Canaday  
Ms. Donna F. Cantor  
Mr. and Mrs. Daniel Canzoniero  
Capital Chapter of Legal Marketing  
Association  
Mrs. Carol J. Carlson  
Mrs. Susie Carpenter  
Mr. Robert L. Case  
Ms. Nancy E. Catron  
Ms. C. Monica Chacon  
Chaney Enterprises  
Mr. Gregory G. Chasko  
Dr. Feng Chen  
Chesapeake Seasons LLC  
Mr. and Mrs. William F. Childs, IV  
Ms. Joanne M. Chrisoulis  
Mr. Charles Christianson  
Dr. Jum Sook Chung  
Ms. Lorraine B. Claggett  
Mr. and Mrs. William H. Clarke  
Mr. David A. Cleaves  
Climate Change and Emissions  
Management Corp  
Dr. and Mrs. Louis A. Codispoli  
Community Trust Foundation, Inc.  
Dr. James Edward Connell  
Mrs. Theresa M. Connors  
Consortium of Ocean Leadership  
Constellation Energy  
Dr. Doug Cook  
Mr. and Mrs. James N. Cooney  
Dr. Lee W. Cooper  
Mr. and Mrs. Richard Cooper  
Mr. William D. Corcoran  
Ms. Lauren Corder  
Ms. Michele McCann Corti  
Ms. Catherine Cosgrove  
Dr. and Mrs. James V. Cotton  
Cove Point Natural Heritage Trust, Inc.  
Dr. and Mrs. Matthew J. Crawford

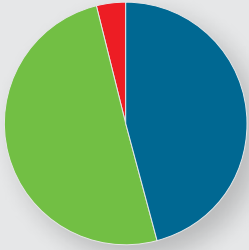
Mrs. Alice W. Cronin  
Mr. and Mrs. James L. Crothers  
CSX  
Murtha Cullina, LLP  
Ms. Carole V. Cummings  
Dr. Eric A. Davidson  
Mr. Michael E. Davis and Ms. Patricia Davis  
Ms. Jane De Bryn  
Mr. and Mrs. Michael Deckelbaum  
Dr. William C. Dennison  
Dr. and Mrs. Jeffrey T. Denton  
Mr. John R. Detweiler  
Mr. and Mrs. Douglas E. Devers  
Mr. Bill R. Dewalt  
Mr. Eric G. Dewey  
DHM2 Inc.  
Dock Street Foundation  
Mrs. Shamarene Layne Donato  
Mr. Joseph Dowley  
Lt. Col. Joseph J. Drach and Ms. Pat Mickelson  
Mr. Michael M. Dreisbach and Ms. Jan Russell  
DRH20 LLC  
Mr. T. Coleman duPont  
Mr. and Mrs. Robert N. Dunbar  
Mrs. Ann C. Dunnington  
Mr. William H. Dunton  
Mr. and Mrs. Marshall Durston, III  
EA Engineering  
EAG Inc.  
Earth Data Incorporated  
Eastern Shore Land Conservancy  
Easton Amateur Radio Society Inc.  
Dr. Andrew Elmore  
Professor Don A. Emerson  
Dr. and Mrs. Keith N. Eshleman  
Ms. Sara L. Ewing  
Mr. and Mrs. George P.A. Eysymontt  
Fair Play Foundation  
Mrs. Rosemary K. Fasolo  
Mr. Robert H. Feldhuhn  
Mrs. Janice E. Felipa  
Fidelity Charitable Gift Fund  
Mr. Thomas B. Finan, Jr. and  
Dr. Mary Kay Finan  
Mr. John N. Fischer  
Mr. and Mrs. Paul Fischer  
Dr. and Mrs. Michael Fisher  
Dr. Thomas R. Fisher, Jr.  
Ms. Frances H. Flanigan  
Mr. John Flanigan  
Mr. Mark Flanigan  
Mr. Ronald J. Flohr  
Mr. Kurt D. Florez  
Flyway Excavating Inc.  
Mrs. Amy L. Forrest  
Ms. Danielle Foster  
France-Merrick Foundation, Inc.  
Mrs. and Mrs. George J. Fox  
Francis E. & Mildred W. Gardiner Jr.  
Family Foundation  
Mr. Jerome M. Frank  
Mr. and Mrs. Howard Freedlander  
Mr. and Mrs. Curtis Friedenber, D.D.S.  
Frostburg Vision Center  
Mr. Peter A. Gallagher  
Mr. and Mrs. Brice R. Gamber  
Ms. Georgine M. Garbisch  
Ms. Elizabeth R. Gates  
The Garden Club of the Eastern Shore  
Ms. Anne L. Gauzens  
Mrs. Stacy L. Gehrt  
Mr. Haifeng Geng, Ph.D.  
Mrs. Doreen Getsinger  
Dr. and Mrs. Keith Ghezzi  
Mrs. Suzanne M. Gibson  
Dr. David M. Gillespie  
Gipe Associates, Inc.  
Mr. and Mrs. Albert B. Gipe  
Mr. Alan P. Girard  
Mr. and Mrs. Richard Gnospelius  
Gordon and Betty Moore Foundation

Ms. Charlotte Sebra Gore  
Mr. Barry P. Gossett  
Mrs. Mary H. Gott  
Ms. Sylvia Gottwald  
Mr. and Mrs. Lawrence A. Grabenstein  
Mr. and Mrs. Donald V. Graf  
Mr. and Mrs. Harry W. Grauel, Jr.  
Grayce B. Kerr Fund, Inc.  
Great Barrier Reef Foundation  
Mr. Robert E. Leighton and Ms. Valerie Green  
Mrs. Karin E. Gregg  
Mrs. Dana Raye Gregory  
Dr. Peter L. Gross  
Mr. Steven K. Hack  
Ms. Alan Hammond  
Dr. Nicholas Hammond  
Mr. and Mrs. Paul T. Hanrahan  
Mr. Alex K. Hardy  
Dr. Dan M. Harman  
Mr. and Mrs. David Harp  
Dr. Lora Harris  
Mr. and Mrs. Patrick C. Hart  
Mr. Sean F. Hart  
Mr. Kyle Hartwell  
Mr. Edgar A. Hatcher, IV  
Ms. Kathleen A. Heil  
Hellerman Baretz Communications LLC  
Dr. Carolyn S. Helmlly  
Mr. and Mrs. Gary Hendrickson  
Mr. Matthew J. Herrington  
Mr. Christopher Heyer  
Dr. and Mrs. Andrew Heyes  
Mrs. Sheila A. Hickman  
Ms. Jane Hilder  
Dr. Robert and Dr. Katia Hilderbrand  
Dr. Russell T. Hill  
Mr. and Mrs. Thomas E. Hill  
Mrs. Deborah C. Hinkle  
Mr. Brian P. Hochheimer and Ms. Marjorie Wax  
Mr. Chadwick O. Hodgkins  
Mr. Thomas J. Hollingshead  
Mrs. Mary M. Holston  
Honeywell International Charity Matching  
Mr. Jerry Hook & Mrs. Jacqueline Smith  
Mr. and Mrs. Charles A. Porter Hopkins  
Mr. and Mrs. Francis Hopkinson, Jr.  
Mr. and Mrs. L. David Horner  
Mrs. Martha Horner  
Dr. Edward D. Houde  
Mrs. Nina Rodale Houghton  
Mr. Gary S. Howard  
Mr. Sean Stuart Hoyt  
Mrs. Sue K. Hu  
Mr. William O. Hubbard  
Mr. and Mrs. Brian Huber  
Ms. Elisabeth Huber  
Hudson River Foundation  
Mr. and Mrs. David Huffman  
Mr. Richard Hynson, Jr.  
Mr. Steven E. Icardi  
Israel Family Foundation  
Izaak Walton League of America—  
Mid-Shore Chapter  
Mr. Scott McGinn Jacoby  
Dr. Rosemary Jagus  
Jerry and Pam Jana  
Ms. Elizabeth Jenny  
Mr. James M. Jepsen  
JLM Services Inc.  
Ms. Barbara M. Johnson  
Ms. Beth Ann Johnson  
Mrs. Kara L. Jones  
Mr. Vernon Brewster Jones  
Mrs. Pauline M. Joseph  
Mr. Song K. Jung  
Mr. and Mrs. Timothy D. Junkin  
Mr. Mason Kalfus  
KCI  
Ms. Donnelle L. Keech  
Ms. Janice Keene and Mr. Richard Sauer  
Mr. Stephen H. Kehoe

Mrs. Margaret D. Keller  
Mr. and Mrs. Hall Kellogg  
Mr. Rense H. Kelsey  
Ms. Patty Kelshaw  
Dr. William M. Kemp  
Dr. and Mrs. Victor S. Kennedy  
Dr. Kelly H. Kilbourne  
Mr. Houston M. Kimbrough, Jr.  
Dr. & Mrs. Dennis King  
Mr. and Mrs. Jerome F. Kinney IV  
Mr. and Mrs. Frank D. Kittredge  
Mr. James N. Klunder  
John S. and James L. Knight Foundation  
Mr. Christopher Koch  
Ms. Patsy M. Koontz  
Mr. William H. Korab  
Mrs. Evelyn M. Koury  
Ms. Rosemary A. Koury  
Ms. Melanie E. Kral  
Ms. Mary Lou Kramer  
Mr. and Mrs. Ronald M. Kreitner  
Ms. Erica H. Kropp  
Dr. Culver S. Ladd  
Ms. Elizabeth S. Langbein  
Dr. Laura L. Lapham  
Ms. Bonnie K. Lapidario  
Mr. William H. Layton  
Leatherback Trust  
Legal Marketing Association—Capital Chapter  
Mr. Andrew K. Leight  
Mr. Burl C. Lewis, Jr.  
Ms. Patricia L. Lewis  
Dr. Yantao Li  
Ms. Kathleen M. Linehan  
Thomas M. Lingan, Esq.  
Linkoping University  
Dr. and Mrs. Robert A. Locastro  
Ms. Elizabeth St. John Loker  
Lotus Kitchen, LLC  
Mr. Horace M. Lowman, Jr.  
Ms. Amy S. Luek  
M&T Bank Corporation  
Mr. and Mrs. Don MacMurray  
Ms. Stacy L. Maffei  
Ms. Alysha Mahunik  
Dr. Thomas C. Malone  
Ms. Mary Ann Manley  
Mr. Richard Marks and Ms. Amy Haines  
Mr. Stanley Martin  
Kenneth Marton  
Maryland Charity Campaign  
Maryland Coastal Bays Program  
Maryland Port Administration  
Maryland Environmental Services  
Drs. Richard and Elizabeth Mason  
Mr. and Mrs. Thomas P. Mathews  
Mrs. Maureen E. Mathews  
Mr. Alex Matusevich  
Mr. and Mrs. Edward W. McElhinny  
Mr. and Mrs. William W. McAllister, Jr.  
Mr. and Mrs. Sull McCartney  
McCormick & Company, Inc.  
Mr. and Mrs. Joseph R. McDaniel  
Ms. Liz A. McDowell  
Ms. Amy S. McEntee  
Mr. John W. McGinnis  
Ms. Elsie McGuire  
McKenna Long & Aldridge LLP  
Ms. Bonnie R. McKenney  
Ms. Erin Elizabeth McLeown  
Ms. Emilie T. McWilliams  
Mr. Edward L. Melisky  
Mr. James P. Mellody  
Ms. Amy Ann Merten  
Mr. and Mrs. Brad Metzger  
Mid-Shore Community Foundation Inc.  
Mrs. Donna Mielke  
Mrs. Sarah Joy Milbourne  
Ms. Karen Miles  
Miles & Stockbridge Foundation, Inc.  
Mr. and Mrs. William Millar  
Dr. Carolyn A. Miller  
Mr. and Mrs. Herbert S. Miller  
Ms. Laura Miller  
Dr. and Mrs. Thomas J. Miller  
Mr. John Mindek  
Mr. and Mrs. Mark W. Moessinger  
Ms. Mary Ann D. Moen  
Mr. Albert Mokhiber  
Mr. and Mrs. Charles O. Monk, II  
The Honorable Karen S. Montgomery  
Dr. Kenneth A. Moore  
Mr. Jeffrey Moran  
Dr. and Mrs. Raymond P. Morgan, II  
Dr. Fredrika C. Moser  
Mr. Pendleton Moudrianakis  
Dr. Dorothy R. Mowry  
Mr. Jonathan P. Murray  
Dr. Laura Murray  
Murtha Cullina LLP  
Mr. Edward J. Musante, Jr.  
Ms. Ellen R. Musante  
Mrs. Janice Musante  
D. Liang Mzhang  
Ms. Lois A. Narr, D.O.  
National Centre for Sustainable Coastal Management  
National Fish and Wildlife Foundation  
National Geographic Education Foundation  
National Marine Educators Association  
Mr. and Mrs. David A. Nemazie  
New Venture Fund  
NewPage Corporation  
Dr. Cecilia and Mr. Robert Nobel  
Dr. Elizabeth Watkins North  
Northeast-Midwest Institute  
Northrop Grumman Corporation  
Mr. Roger C. Nottingham  
Mrs. Valinda R. Nwadike  
Offenbacher L S  
Ms. Helen Olde  
Ms. Janice O'Lear and Mr. Daryl Coffman  
Mr. Mark Oliphant  
Mr. Richard Olson  
Mrs. Linn W. Ong  
Rev. Dr. and Mrs. William J. Ortt  
Dr. Margaret A. Palmer  
Mr. and Mrs. Charles Pashayan, Jr.  
Peck Family Foundation  
Mr. and Mrs. Charles E. Peck  
Mr. Mark L. Pellerin  
Petermann Designs  
Mr. and Mrs. Joseph E. Peters  
Phillip E. & Carole R. Ratcliffe Foundation  
Mr. Albert Phillips  
Mrs. Doris W. Phillips  
Mr. G. Steele Phillips  
Dr. and Mrs. James J. Pierson  
Mr. and Mrs. David D. Pitard  
Dr. Allen R. Place  
The Honorable S. Jay Plager  
Mr. Alexander Plunkett  
POGO Secretariat Plymouth Marine Lab  
Mr. John D. Porcari  
Port Tack, Ltd.  
Mr. Jonathan J. Powers  
Ms. Judith Price  
Mr. Michael and Ms. Kathy Quattrone  
Ms. Jennifer M. Rabil  
Raccoon River Watershed  
Ms. Constance A. Ralston  
Mrs. Martha J. Rau  
Robert D. Rauch & Associates, Inc.  
Mr. and Mrs. Robert D. Rauch  
Ravenal Foundation  
Mr. Randy Reay  
Mrs. Norma Redele  
Dr. Paul M. Reinbold  
Mr. and Mrs. Sean P. Reincke  
Mr. and Mrs. Thomas H. Reynolds, Jr.  
Mr. and Mrs. George W. Richards  
Mr. and Mrs. John M. Riley, Ph.D.  
Ritchie Trucking and Excavating  
Dr. and Mrs. William Ritchie  
RK&K  
Robert W. Baird & Co., Inc.  
Ken Roberts, M.D.  
Mrs. Margie J. Roberts  
Mr. and Mrs. D. Bruce Rogers  
Mrs. Diane Rohman and Mr. Charles Monet  
Mr. and Mrs. Reed T. Rollo, Jr.  
Dr. and Mrs. Michael R. Roman  
Dr. Christopher L. Rowe  
Mrs. Lori K. Rowe  
Ms. Sandra Rowland-Hack  
Mr. Raymond Todd Rowley  
Rubenstein Technology Group Inc  
Ms. Adrienne W. Rudge  
Mr. Steve T. Rupard  
Ms. Janis Russell  
Mrs. Tina Ryan  
Dr. William F. Ryan and Joan T. Reichtsmeier  
Mr. George K. Saba  
Mrs. Kate Saba  
Ms. Theresa Suzanne Saba  
Mr. Dale E. Sams  
Ms. Leslie Sandler  
Alyssa Sandrowitz  
Dr. Lawrence P. Sanford  
Frank and Elaine Sapp  
Saul Ewing LLP  
Dr. Johan Schijff  
Ms. Mary Ann Schindler and Mr. Martin Hughes  
Mr. Scott Schirmer  
Dr. Eric M. Schott  
Mrs. Beth A. Schucker  
Ms. Whitney Schumm  
Mr. Charles P. Schutt, Jr.  
Mr. Jack T. Seabreeze  
Ms. Crystal F. Sears  
Dr. David H. Secor  
Mr. and Mrs. Thomas Seip  
Mr. Alan Septoff  
Mr. and Mrs. Wayne Shaner  
Ms. Jane B. Shapiro  
Ms. Roberta Shapiro  
Ms. Julianne Shinnick  
Mr. and Mrs. Langley Shook  
Mr. John T. Short  
Kelly Ann and Tripper Showell  
Mrs. and Mrs. Alfred Sikes  
Simons Foundation  
Mrs. Leah M. Singelstad  
Mr. George L. Sisson, III  
Mr. and Mrs. Ward Slacum  
Alfred P. Sloan Foundation  
Mr. Jacobus P. Smit  
Mr. Edgar A. Smith  
Dr. Eva M. Smorzaniuk  
Mr. Mathew Snow  
Southern Maryland Electric Co-Op  
Mr. Mark Spalding  
Mr. and Mrs. Mark Spiggle  
Mr. and Mrs. Jeff Staley  
Ms. Heather Mary Stapleton  
Mrs. Linda Starling  
State and Federal Contractors Water Agency  
Mr. George Stimmel  
Ms. Michelle Stefanick  
Straughan Environmental Services  
Mrs. Eileen K. Straughan  
Mrs. Meta B. Stroupe  
Mr. and Mrs. Brendan V. Sullivan, Jr.  
Mr. Kevin R. Sullivan  
Ms. Emily Sun  
Mr. Joseph Szymanski  
Talbot Preservation Alliance  
Dr. Mario Tamburri  
Mrs. Joyce K. Tamer  
Dr. Volkan O. Taskin and Ms. Sharon Houser  
Ms. Lauren A. Tenney  
Ms. Elizabeth J. Tenore  
Ms. Lauren A. Tenney and Mr. Samuel H. Perry  
Ms. Olga Terekhina  
Mr. M. Whiting Thayer  
The Clark Charitable Foundation, Inc.  
The Concordia Foundation, Inc.  
The Ed and Andy Smith Fund  
The Frederick W. Richmond Foundation Inc.  
The Gero Group LLC  
The Henry L. & Grace Doherty Charitable Foundation  
The Keith Campbell Foundation for the Environment  
The Pew Charitable Trusts  
Mr. Eric Theil  
Ms. Cynthia E.G. Thomas  
Ms. Jane Thomas  
Mrs. Lisa L. Thompson  
Mr. William W. Thompson  
Ms. Zainab B. Thompson  
Mr. and Mrs. Richard C. Tilghman, Jr.  
Ms. Jill M. Timmons and Mr. Patrick Kennedy  
Tompkin Bay Oyster Company  
Town Creek Foundation Inc.  
Ms. Aileen B. Train  
Tri County Abstract, Inc.  
Triway Enterprise, Inc.  
Ms. Adrianna Trossbach  
Ms. Sara Turner  
United Charity Campaign of Maryland  
USM Foundation  
Mr. Adam Valcourt  
Mr. and Mrs. Robert L. VanFossan  
Ms. Janice Van Stolk  
Venable Foundation  
Verso Corporation  
Ms. Patricia A. Vinal  
Dr. Lisa A. Wainger  
Ms. Sara S. Walker  
Mr. and Mrs. David Wayne Wallace  
Mr. David M. Walsler, Jr.  
Mr. Carroll J. Waskins  
Waters Corporation  
Dr. and Mrs. Stanley P. Watkins  
Mr. Daniel Watson  
Mrs. Patricia A. Weaver  
Mr. and Mrs. Philip J. Webster  
Mr. Bruce Weden  
Mr. Howard Weinberg  
Mrs. Margaret M. Welch  
Mr. W. Perry Welch  
Dr. and Mrs. Clifton F. West  
Capt. Douglas D. West  
Ms. Sandra Saba Weston  
Mr. and Mrs. Scott Wheeler  
Dr. Michael J. Wilberg  
The Willamette River Initiative  
Ms. Dian M. Williams  
Ms. Carolyn H. Williams and Mr. Colin Walsh  
Ms. Joanna F. Williams  
Ms. Martha Williams  
Mr. Robertson C. Williams, III  
Ms. Rochelle N. Williams  
Ms. Elizabeth J. Wilson  
Mrs. Angela M. Wiltse  
Mr. and Mrs. Thomas W. Wimer  
Mr. Joseph Winters  
Mrs. Patricia H. Wirth  
Mrs. Theresa B. Wong-Hollander  
Ms. Kathryn V. Wood  
Woods Hole Oceanographic Institute  
Ms. Emily Woods  
Mr. Glenn O. Workman, Jr.  
Mr. and Mrs. Douglas G. Worrall  
Wye Financial & Trust  
Ms. Bonnie P. Yanchisin  
Mr. John C. Yorkilous  
Ms. Margaret L. Young  
Ms. Joanne L. Zimolzak  
Ms. Inna Zozulyak  
Mr. and Mrs. Francis O. Zumbrun, II  
Mr. James A. Zurn  
Mr. Howard A. Zwemer  
Mrs. Dorothy D. Zwissler

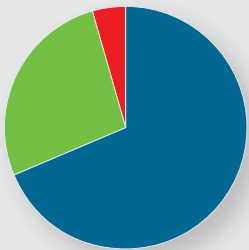
To all of the donors listed above, we appreciate your support of the University of Maryland Center for Environmental Science as we work to ensure a healthy environment for the Chesapeake Bay and our environment. We apologize if we inadvertently omitted any contributors from the past year. To make additional contributions, please visit [umces.edu/giving](http://umces.edu/giving) or contact David Balcom at 410-234-8857 or [dbalcom@umces.edu](mailto:dbalcom@umces.edu).

# FINANCIALS



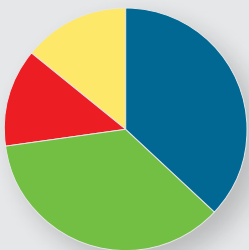
## Expenditures

- State Appropriation: 44%
  - Contracts and Grants: 48%
  - Other: 8%
- \$47 million**



## Research Awards

- Federal: 61%
  - State: 24%
  - Private/Other: 15%
- \$24.9 million**



## Federal Awards by Agency

- National Oceanic and Atmospheric Administration: 37%
  - National Science Foundation: 36%
  - Environmental Protection Agency: 13%
  - Other: 14%
- \$15.2 million**

## UNIVERSITY SYSTEM OF MARYLAND

Robert L. Caret, Chancellor

### BOARD OF REGENTS

James L. Shea, Chair  
 Gary L. Attman  
 Norman R. Augustine  
 Joseph Bartenfelder  
 James T. Brady  
 Louise Michaux Gonzales  
 Linda R. Gooden  
 Barry P. Gossett  
 Michelle A. Gourdine, M.D.  
 The Hon. Francis X. Kelly, Jr.  
 David Kinkopf  
 Robert Neall  
 Robert L. Pevenstein  
 Robert D. Rauch  
 Dr. Frank M. Reid, III  
 Thomas G. Slater  
 Sydney Comitz, Student Regent

### LEADERSHIP

Donald F. Boesch  
 President

David A. Balcom  
 Vice President for Institutional Advancement

William C. Dennison  
 Vice President for Science Applications

Edward D. Houde  
 Vice President for Education

Lynn M. Rehn  
 Vice President for Administration

David A. Nemazie  
 Chief of Staff

### LABORATORY DIRECTORS

Eric A. Davidson  
 Director, Appalachian Laboratory

Russell T. Hill  
 Director, Institute of Marine and Environmental Technology

Thomas J. Miller  
 Director, Chesapeake Biological Laboratory

Fredrika C. Moser  
 Director, Maryland Sea Grant College

Michael R. Roman  
 Director, Horn Point Laboratory

### BOARD OF VISITORS

Charles O. Monk II, Chair  
 Paul J. Allen  
 Thomas L. Buckmaster  
 Victoria Childs  
 James E. Connell  
 Francis E. (Skip) Gardiner, Jr.  
 Donald Graf  
**Janice Keene**  
**Thomas M. Lingal**  
 Jonathan Murray  
 J. Mitchell Neitzey  
 C. E. Peck  
 John D. Porcari  
 Kathy Quattrone  
 Eileen Straughan  
 David W. Wallace  
 The Honorable Harry Hughes,  
 Chair Emeritus

### LOCATIONS

**Appalachian Laboratory**  
 301 Braddock Road  
 Frostburg, MD 21532  
 301-689-7100

**Chesapeake Biological Laboratory**  
 11 Williams Street  
 Solomons, MD 20688  
 410-326-4281

**Horn Point Laboratory**  
 2020 Horns Point Road  
 Cambridge, MD 21613  
 410-228-8200

**Institute of Marine and Environmental Technology**  
 701 E. Pratt Street  
 Baltimore, MD 21202  
 410-234-8800

**Maryland Sea Grant College**  
 4321 Hartwick Road, Suite 300  
 College Park, MD 20740  
 301-405-7500

**Center Administration**  
 P.O. Box 775  
 Cambridge, MD 21613  
 410-228-9250

# "TAKE THE LEAP" TOWARD CHALLENGES THAT WILL COME

The University of Maryland Center for Environmental Science graduated the next generation of environmental leaders at its second annual commencement ceremony. This year, 19 students received joint degrees.



Professor Russell Hill of the Institute of Marine and Environmental Technology hoods his Ph.D. student Jeanette Davis.