

# From the mountains to the sea... knowledge is our best NATURAL RESOURCE



2013 Annual Report

## Message from the President



The University of Maryland Center for Environmental Science is one of the most distinctive institutions in the world. Our scientists conduct research programs that span from the Appalachian Mountains to the Atlantic Ocean and beyond through laboratories strategically located in Western Maryland, Southern Maryland, the Eastern Shore, and Baltimore's Inner Harbor.

In particular, our scientists work collaboratively across the laboratories to conduct critical studies of the Chesapeake Bay and its watershed. For example, they are working together to determine the impacts of new power plant emissions on water quality in the Bay. As nitrogen emissions from smoke stacks are reduced, researchers can follow the consequence in the air, mountain streams, large rivers such as the Potomac, the Bay, and into the ocean.

The vast data we now generate with automatic sampling devices deployed throughout the region support powerful analyses for determining the impact of pollution policies. By the way, our research indicates that air pollution reduction policies are achieving benefits as the amount of nitrogen and other pollutants, such as mercury, are being reduced in the air and water.

Such comprehensive studies across air, land, and water are necessary to fully understand, predict, mitigate, and adapt to global changes. These changes are occurring in our climate systems, chemical cycles, water resources, soils, forests, and fisheries. Addressing them requires researchers to work across environmental media and geographic scales, and from single genes to entire ecosystems. Our faculty has broad expertise and the desire to work collaboratively to understand and provide solutions to the greatest challenges facing Maryland, the Chesapeake Bay watershed, and coastal systems throughout the world.

I am exceptionally proud of the collaborative research being conducted in our laboratories, from the mountains to the sea, to help our state, nation and our world achieve a prosperous and more sustainable future.

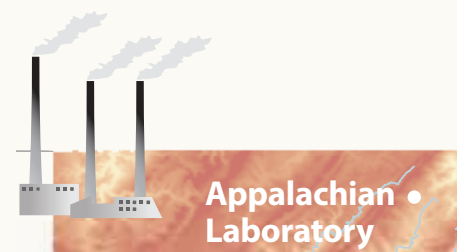
*Donald F. Boesch*

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.

**FACULTY LISTING:** Tsvetan Bachvaroff • Helen Bailey • Hongsheng Bi • Donald Boesch • William Boicourt • Walter Boynton • Mark Castro • Shenn-Yu Chao • Feng Chen • J. Sook Chung • Louis Codispoti • Victoria Coles • Lee Cooper • Jeffrey Cornwell • William Dennison • Andrew Elmore • Katia Engelhardt • Keith Eshleman • Solange Filoso • Thomas Fisher • Matthew Fitzpatrick • Robert Gardner • Edward Gates • Patricia Glibert • Michael Gonsior • Jacqueline Grebmeier • Lora Harris • Andrew Heyes • Robert Hilderbrand • Russell Hill • Raleigh Hood • John Hoogland • Edward Houde • Rosemary Jagus • Todd Kana • Stephen Keller • William Kemp • Victor Kennedy • Hali Kilbourne • Dennis King • Evamaria Koch • Laura Lapham • Ming Li • Yantao Li • Donald Merritt • Thomas Miller • Carys Mitchelmore • Raymond Morgan • Laura Murray • David Nelson • Nicholas Nidzicko • Elizabeth North • Judith O'Neil • Cynthia Palinkas • Margaret Palmer • Kennedy Paynter • James Pierson • Allen Place • Louis Plough • Michael Roman • Christopher Rowe • Lawrence Sanford • Alyson Santoro • Johan Schijf • Eric Schott • David Secor • Court Steveson • Diane Stoecker • Cathlyn Stylinski • Mario Tamburri • Jeremy Testa • Lisa Wainger • Michael Wilberg • Michael Williams



**Cleaner air has unexpected benefit of cleaner water** ▶ A new study shows that the reduction of pollution emissions from power plants in the mid-Atlantic due to the Clean Air Act is also improving the quality of the water that ends up in the Chesapeake Bay.

**Citizen scientists recruited to help bring back the American chestnut tree** ▶ Researchers enlist local residents to grow and monitor saplings of this species decimated by blight in hopes it can contribute to water quality in Maryland streams again.



**Researchers work on predicting how trees will adapt to rapid climate change** ▶ A team of researchers is examining how northern forests across North America will adjust and survive in a changing environment.

**Map of buried streams could lead to smarter development** ▶ The first complete and accurate maps show where streams once flowed and still flow through urban areas, critical for quantifying impact of urbanization on aquatic ecosystems.

**Algae from the Chesapeake helps clean the air** ▶ Science partners with business to find an algae that scrubs greenhouse gases from the exhaust flues at the Back River Wastewater Treatment Plant.

**Aquaculture breakthrough makes raising fish for food more sustainable** ▶ The discovery of a vegetarian diet for carnivorous marine fish could make it easier to grow essential food sources far from the coast while protecting the other fish in the sea.



**Study of menhaden fishery aims to find a happy ecosystem balance** ▶ A team of scientists is investigating the balance between fishing and protecting menhaden to help develop smart fishing management guidelines.

**A new look at oyster restoration practices proves a little help will go a long way** ▶ Research shows limiting fishing and improving habitat are key to the comeback of oysters in the Bay.



**Scientists study impact of offshore wind energy on marine life** ▶ A network of researchers is evaluating the environmental opportunities and consequences of offshore wind power, including the impact of noise from offshore wind farm construction on marine mammals.

## From the mountains to the sea —a year in science

With locations strategically placed between the mountains and the sea, our research laboratories provide scientists direct access to Maryland's diverse natural ecosystems, allowing us to be a leader in the science of coastal environments and their watersheds. From the headwaters of the Chesapeake Bay in the Appalachian Mountains to the Atlantic Coast and beyond, see what our researchers have been studying to help improve the environment around us.



**Chesapeake Bay health makes modest improvement** ▶ A "C" grade on the annual report card indicates progress in efforts to reduce nitrogen and phosphorus levels making their way into the Bay.

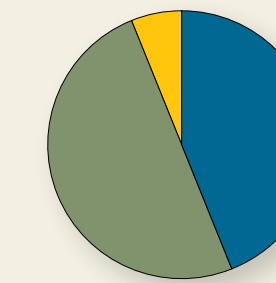


**The quest to reduce nutrients and sediments in the Bay** ▶ A team of scientists is working with the community to determine the impact of cover crops, stream buffers, and rain barrels on water quality.

**Oyster culture facility produces record number of oyster spat with partners to aid recovery effort** ▶ More than 1.2 billion oysters were added to the restoration effort, the first time any oyster hatchery nationwide has produced more than one billion Eastern oyster spat in a single season.

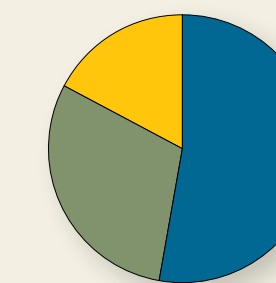
**Storm prediction technology could help coastal communities prepare for big storms** ▶ Computer models predict the impact of sea level rise and storm surge to help officials prepare for emergencies and plan coastal development.

## Financials



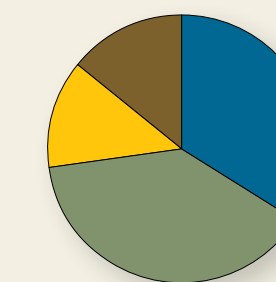
**Expenditures**

- State Appropriation: \$19.7M (43%)
- Contracts and Grants: \$23.3M (50%)
- Other: \$3.2M (7%)



**Research Awards**

- Federal: \$10.1M (53%)
- State: \$5.8M (30%)
- Private: \$3.2M (17%)



**Federal Awards by Agency**

- National Science Foundation: \$3.4M (34%)
- National Oceanic and Atmospheric Administration: \$3.9M (39%)
- Department of Transportation: \$1.3M (13%)
- Other: \$1.5M (14%)



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**Dr. Fredrika Moser**  
 Director, Maryland Sea Grant College  
**David A. Nemazie**  
 Associate Vice President for External Affairs  
**Dr. Michael R. Roman**  
 Director, Horn Point Laboratory

LABORATORIES

**Appalachian Laboratory**  
 301 Braddock Road  
 Frostburg, MD 21532  
 301-689-7100  
 www.umces/al  
**Chesapeake Biological Laboratory**  
 P.O. Box 38  
 Solomons, MD 20688  
 410-326-4281  
 www.umces/cbl  
**Horn Point Laboratory**  
 2020 Horns Point Road  
 Cambridge, MD 21613  
 410-228-8200  
 www.umces/hpl  
**Institute of Marine and Environmental Technology**  
 701 E. Pratt Street  
 Baltimore, MD 21202  
 410-234-8800  
 www.imet.usmd.edu  
**Maryland Sea Grant College**  
 College Park, MD  
 301-405-7500  
 www.mdsg.umd.edu  
**Center Administration**  
 P.O. Box 775  
 Cambridge, MD 21613  
 410-228-9250

*One of the world's premier research centers focused on ecosystem science, the University of Maryland Center for Environmental Science strives to advance knowledge of the environment and develop new ideas to guide our state, nation and world towards a more sustainable future.*



# Graduate Education

## Joint degrees are on the horizon

As one of the only universities in the nation with a singular focus on environmental science, we train and inspire the nation's next generation of scientists and resource managers as part of the University System of Maryland's nationally ranked graduate program in marine and estuarine science.

Every year, nearly 100 graduate students work side-by-side with the best environmental scientists in the world, researching the effects of urbanization on stream ecosystems to the comeback of submerged grasses in the upper Bay to the sustainability of the blue crab harvest.

Long a partner in providing hands-on and classroom training, UMCES is now authorized to grant graduate degrees jointly with Maryland public universities.

Beginning in 2014, students may opt to add the University of Maryland Center for Environmental Science to their diplomas. UMCES will also offer professional development courses for credit and certificates in the near future.



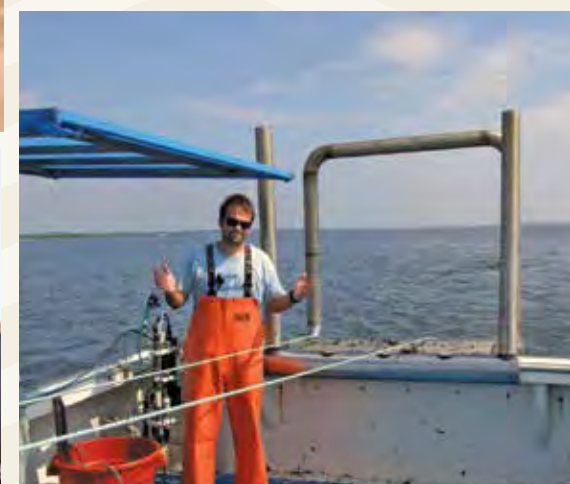
## 2012-2013 Graduates

**Christian W. Conroy, M.S.**  
 Fisheries Science/Dr. David Secor  
**Laura Gemery, M.S.**  
 Environmental Science/Dr. Lee Cooper  
**Adam J. Schlenger, M.S.**  
 Environmental Science/Dr. Elizabeth North  
**Margaret A. Sexton, Ph.D.**  
 Oceanography/Dr. Raleigh Hood  
**Brianne M. Walsh, M.S.**  
 Oceanography/Dr. Judy O'Neil  
**Lisa M. Wilt, M.S.**  
 Ecology/Dr. Jackie Grebmeier  
**Caroline S. Fortunato, Ph.D.**  
 Oceanography/Dr. Byron Crump  
**Ammar Hanif, M.S.**  
 Environmental Microbiology/Dr. Eric Schott  
**Momoko Ishikawa, M.S.**  
 Fisheries Science/Dr. Victor Kennedy



**Meghann E. Niesen, M.S.**  
 Ecology/Dr. Lora Harris  
**Michael H.P. O'Brien, M.S.**  
 Fisheries Science /Dr. David Secor  
**Jason M. Robinson, Ph.D.**  
 Fisheries Science /Dr. Michael Wilberg  
**Rebecca M. Swerida, M.S.**  
 Environmental Science/Dr. Evamarie Koch/  
 Dr. Larry Sanford  
**Jeremy M. Testa, Ph.D.**  
 Oceanography/Dr. Michael Kemp  
**Aaron M. Watson, Ph.D.**  
 Environmental Microbiology/Dr. Allen Place  
**Kevin A. Meyer, Ph.D.**  
 Oceanography/Dr. Judy O'Neil

Area of concentration/faculty mentor



## Highlights of the Year



### Scientists Discover Key to Making Aquaculture Sustainable

The faculty-student research team of **Dr. Allen Place** and **Aaron Watson** at the Institute of Marine & Environmental Technology developed a vegetarian diet that makes it possible to raise marine fish in an aquaculture setting, the key to a sustainable industry as the world's need for protein increases.

"This makes aquaculture completely sustainable," said Dr. Place. "The pressure on natural fisheries in terms of food fish can be relieved. We can now sustain a good protein source without harvesting fish to feed fish."



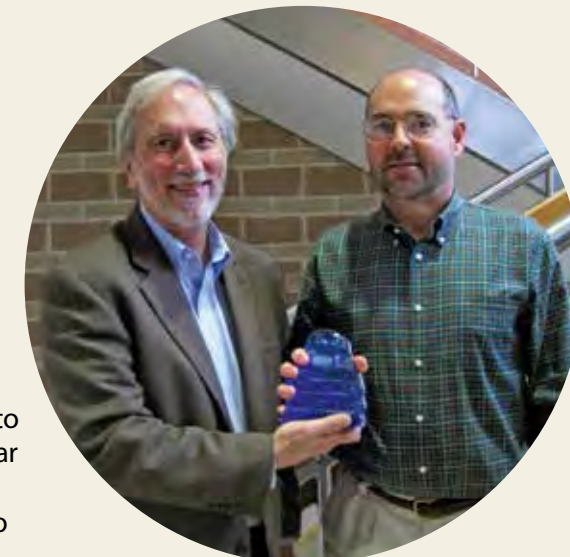
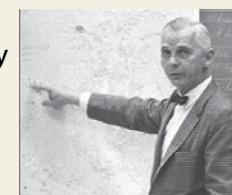
### Biologists Lead International Team to Monitor Arctic Changes

**Dr. Jackie Grebmeier** and **Dr. Lee Cooper** of the Chesapeake Biological Laboratory are leading an international team of scientists to establish a distributed biological observatory in the Arctic. Observing stations in five "hot" spots of activity will monitor everything from the temperature and salinity of the water to how many seabirds, walrus, and polar bears call the area home to document how Arctic creatures are responding to climate change.

"It has been projected that there won't be ice in the summer in the Arctic Ocean by 2050," said Dr. Cooper. "But the ice is disappearing faster than all of the models."

### Fisheries Building Dedicated in Honor of Dr. Eugene Cronin

The Chesapeake Biological Laboratory rededicated the ecological and toxicology research building in honor of **Dr. Eugene Cronin**, the laboratory's second director and passionate advocate for health of the Chesapeake Bay. Called the "Admiral of the Chesapeake" by Governor Harry Hughes, Cronin (1907-1998) was an estuarine ecologist who conducted ground-breaking research on the biology, ecology, and fisheries of blue crab.



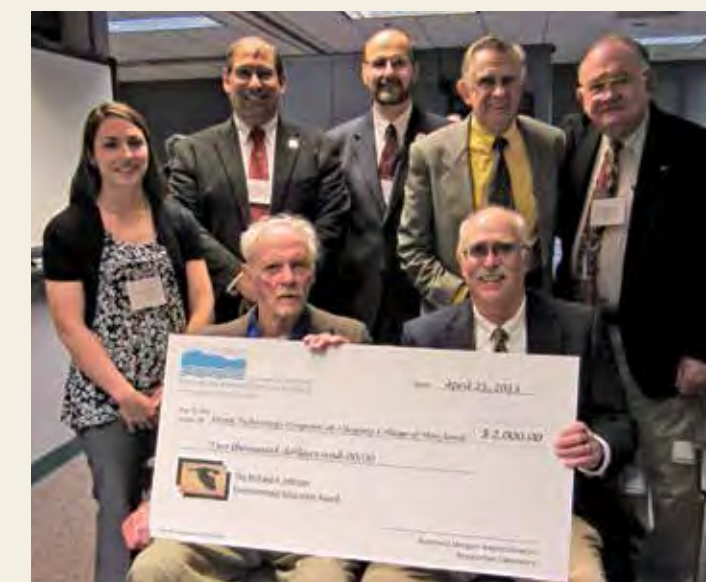
### Keith Eshleman honored with President's Award for fracking study

Appalachian Laboratory professor and watershed hydrology expert **Dr. Keith Eshleman** was given the President's Award for Excellence in Application of Science for his leadership in preparing a comprehensive study on best management practices for fracking. The landmark assessment of the safest way to extract natural gas from shale to protect the environment, natural resources, and public safety will advise Maryland on potential development of the Marcellus Shale formation.



### Sea level along Maryland's shorelines could rise 2 feet by 2050

A new independent scientific report on sea-level rise recommends that the State of Maryland should plan for a rise in sea level of as much as 2 feet by 2050. Led by **Dr. Don Boesch**, the report was prepared by a panel of scientific experts including **Dr. Bill Boicourt** and **Dr. Ming Li** of the Horn Point Laboratory in response to Governor Martin O'Malley's Executive Order on Climate Change and "Coast Smart" Construction. The projections are based on an assessment of the latest climate change science and federal guidelines.



## Solutions through SCIENCE

"The only chance the Chesapeake has is if someone smart enough about the Bay figures out how to make it happen, and I think that person will come out of the UMCES' Chesapeake Biological Laboratory," said Joe Drach, a long-time supporter with his wife Pat Mickelson, both former Board of Visitors members who have spent decades fishing and enjoying the Bay.

Several years ago, he and James P. Mellody, his best friend and navigator while flying planes in the Air Force, decided to put their money where it mattered most.

"We've flown over every body of water in the world," Drach said, from Antarctica to the North Pole. "I said, 'I'm going to do something about the water if I can with some scholarships at CBL,' and he said, 'I'll help you.'"

Established in 2008, the Drach-Mellody Navigator Award is an annual award made by CBL faculty to promote excellence in graduate research. Drach has also established a scholarship fund, and he is considering a planned gift to make the fund available for UMCES' CBL students in perpetuity.

"The most important real estate in Maryland is the Bay," said Drach. "The total capability of the State of Maryland should be concentrated in the University of Maryland, particularly at UMCES. The little thing we can do is hope that folks will come up with a way to maintain the Bay. It's impossible to restore it, but we can save it."

Support our efforts to change the way society understands and manages the environment through the power of science. Visit [www.umces.edu/giving](http://www.umces.edu/giving) or contact [David Balcom](mailto:David.Balcom@umces.edu) at 410-234-8857 or [dbalcom@umces.edu](mailto:dbalcom@umces.edu).