2019 Distinguished Scientist Seminar
Semester in Environmental Science
MBL ECOSYSTEMS CENTER, WOODS HOLE, MA

Dr. Michael Pace
Commonwealth Professor, University of Virginia
Dept, Environmental Sciences

Cross Boundary Fluxes, Trophic Cascades, and Ecosystem Stability Explored with Whole Lake Experiments.

September 13th— 3:00 PM
Speck Auditorium, MBL

Michael Pace has led pioneering research on how food web structure affects biogeochemistry productivity, and microbial processes in lakes, reservoirs, rivers and coastal lagoons. His work relies heavily on large scale experimental manipulations, including, predator and grazer removal and whole lake manipulations. He is currently conducting research on resilience of aquatic ecosystems, effects of invasive species, synchrony between aquatic and terrestrial ecosystems, and harmful algal blooms.

Pace is a principle investigator in the Virginia Coast Reserve Long Term Ecological Research (LTER), which is investigating effects of climate on dynamics in coastal barrier ecosystems. He is also engaged in several National Science Foundation (NSF) **Ea**rly-concept **G**rants for **E**xploratory **R**esearch (EAGER), one exploring links and lags between processes on land and in adjacent aquatic systems, the other focused on use of eddy covariance to understand the balance between respiration and productivity by measuring air-water gas exchange in shallow marine systems. NSF's EAGER program was designed to support transformative or exploratory research that explores new topics, novel methods, or unconventional interdisciplinary approaches to science.

Pace received his undergraduate degree from the University of Virginia (magna cum laude, Phi Beta Kappa). He completed an M.S. in Zoology and Ph.D. in Ecology at the University of Georgia. He was a Postdoctoral Fellow at McGill University and an Assistant Professor of Oceanography at the University of Hawaii. Prior to joining the University of Virginia in 2008, he was a Senior Scientist and Assistant Director at the Cary Institute of Ecosystem Studies in Millbrook, New York. He has published more than 200 peer-reviewed papers, and received numerous awards and honors for his work. He was recognized by the Association for the Sciences of Limnology and Oceanography (ASLO) with the G. Evelyn Hutchinson Medal in 2009 and by the International Society of Limnology with the Naumann-Thienemann Medal in 2016. He was elected a Fellow of the American Association for the Advancement of Science in 1995, and was visiting "Eminent Ecologist" at the Kellogg Biological Station, Michigan State University in 2005. During 2018-2020, he is serving as President of ASLO.

Readings:

Pace, M.L., J.J. Cole, S.R. Carpenter, J.F. Kitchell (1999) Trophic Cascades Revealed in Diverse Ecosystems. Trends in Ecology and Evolution. 14:483-488. (required)

Pace, M.L., J.J. Cole, S.R. Carpenter, J.F. Kitchell, J.R. Hodgeson, M.C. Van de Bogert, D.L. Bade, E.S. Krtizberg and D. Bastviken (2004). Whole-lake carbon-13 additions reveal terrestrial support of aquatic food webs. Nature 427:240-243. (additional recommended reading)

Pace, M.L. R.D. Batt, C.D. Buelo, S.R. Carpenter, J.J.Cole, J.T. Kurtzweil, and G.M. Wilkinson (2017). Reversal of a cyanobacterial bloom in response to early warnings. Proceedings of the National Academy of Sciences 114:352-57.(additional recommended reading)

2019 Distinguished Scientist Seminar
Semester in Environmental Science
MBL ECOSYSTEMS CENTER, WOODS HOLE, MA

Dr. Serita Frey
Professor, University of New Hampshire
Department of Environmental Sciences

Going Underground: Unearthing the Role of the Soil Microbiome in a Warmer, Fertilized World.

September 27th— 3:00 PM
Loeb G70, MBL

The top few meters of soil around the globe store three to four times as much organic carbon as is present in the atmosphere in the form of CO_2. In a warmer, wetter world, will microbes in the soil respond by decomposing more of this organic matter to CO_2, further accelerating climate change? How do greater nitrogen inputs due to acid deposition or increased mineralization affect soil processes, litter decay and microbial communities? These are questions addressed by Serita Frey's work. Her research explores controls on carbon and nitrogen dynamics and fungal communities in soils. Her interests span from the globe to the genome.

Dr. Frey is microbial ecologist who has led the research into how the composition and function of bacteria and fungi responds to a 30 year soil warming experiment at the Harvard Forest Long Term Ecological Research (LTER) site in Petersham, MA. She is especially interested in the response of mycorhizzae and saprophytic fungi to changing climate and nitrogen inputs.

She received her Bachelor's and Master's degree at the University of Virginia and her doctorate at Colorado State University, where she has been named a "Distinguished Alumna" of the graduate program. She has held positions as Research Associate at Colorado State, Assistant Professor and Affiliated Scientist in the School of Natural Resources at Ohio State, before moving to University of New Hampshire (UNH) in 1999 where she rose to full professor in 2011. She was awarded a prestigious National Science Foundation (NSF) Early Career Development Grant in 2005. She was a recipient of the Bullard Fellowship at the Harvard Forest in 2008-9, and the Karen Von Damm Leadership Award at the UNH in 2011. She is also currently Editor-in-Chief of the professional journal, *Issues in Ecology*.

Dr. Frey has served in a numerous key advisory and leadership roles in the NSF funded National Ecological Observatory Network (NEON), which is a large scale effort to obtain long term data on ecosystem health and function by standardizing sampling strategies and installing state-of-the-art instrumentation at a set of representative sites across North America. She has participated in the NEON Biogeochemical Cycles Subcommittee (2005) and the NEON Design Team (2007). In 2015-16 she was elected to the NEON Board of Directors, and she chaired the Science, Technology and Engagement committee of NEON from 2016-18.

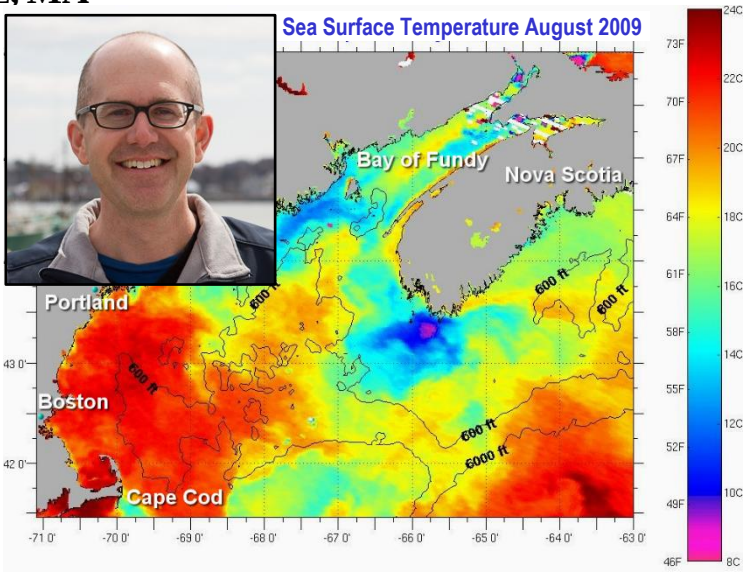
Readings:

Melillo, J.M. S.D. Frey, K. M. DeAngelis, W.J. Werner, M.J. Bernard, F.P.Bowles, G. Pold, M.A. Knorr,and A.S. Grand (2017). Long-term pattern and magnitude of soil carbon feedback to the climate system in a warming world. *Science* 358:101-105.

Morrison, E.W. A. Pringle, L.T.A. van Diepen, S.D. Frey (2018). Simulated nitrogen deposition favors stress-tolerant fungi with low potential for decomposition. *Soil Biology and Biochemistry* 125:75-85.

2019 Distinguished Scientist Seminar
Semester in Environmental Science
MBL ECOSYSTEMS CENTER, WOODS HOLE, MA

Dr. Andrew Pershing
Chief Scientific Officer
Gulf of Maine Research Institute



Survival skills for the Anthropocene: what marine heatwaves and other ocean surprises can teach us about living in a warming world

October 11th— 3:00 PM
Lillie Auditorium, MBL

Andrew Pershing's research group has documented the occurrence of "surprises" in the northwest Atlantic and Gulf of Maine— ***marine heatwaves*** — annual mean temperatures that are at least two standard deviations above the average of the prior 30 years. These events should become more likely as global climate warms; however, even accounting for the predicted trends, the recent increase in frequency of extreme deviations in ocean temperatures is unexpected and alarming. It is affecting species such as lobsters, copepods, cod and whales, and changing ecosystem properties including total fishery landings and species diversity.

Pershing employs a variety of techniques, including analysis of past changes in physical and ecological conditions, as well as advanced mathematical and computer models to predict and explain how the abundance of marine fish and plankton changes through time. Although he has studied population dynamics in a wide variety of marine organisms, he has special interest in copepod zooplankton.

He is currently the Chief Scientific Officer at the Gulf of Maine Research institute (GOMRI) and runs the Climate Change Ecology Lab. Before assuming leadership of the scientific program at GOMRI, he was Associate Professor, School of Marine Sciences, University of Maine and a Research Scientist at GOMRI. Dr. Pershing came to University of Maine in 2006 from the Department of Earth and Atmospheric Sciences and Faculty of Computing and Information Science at Cornell University, where he was Assistant Professor. He completed his doctorate and postdoctoral work at Cornell and his undergraduate degree at Brown University.

He is actively involved in regional efforts to understand and adapt to climate change and was recently the lead author for the "Oceans and Marine Resources" chapter of the 4th US National Climate Assessment. In 2012, he testified before U.S. House of Representatives Committee on Natural Resources Subcommittee on Fisheries, Wildlife, Oceans, and Insular Affairs on climate impacts on fisheries. In 2014, The American Society of Limnology and Oceanography honored him with the Yentsch-Schindler Early Career Award, which recognizes outstanding and balanced contributions to research, science training, and broader societal issues such as resource management, conservation, policy, and public education.

Readings:

Pershing, A.J., K.E. Mills, A.M. Dayton, B.S. Franklin, and B.T. Kennedy. 2018. Evidence for adaptation from the 2016 marine heatwave in the Northwest Atlantic Ocean. *Oceanography* 31(2), *https://doi.org/10.5670/oceanog.2018.213*

2019 Distinguished Scientist Seminar
Semester in Environmental Science
MBL ECOSYSTEMS CENTER, WOODS HOLE, MA

Dr. Jennifer Jenkins
Vice President and Chief Sustainability Officer, Enviva LP

Modern bioenergy's role in the global energy transition

October 25th— 3:00 PM
Loeb G70, MBL

Since the onset of the industrial revolution more than a century ago, human activities have released more than 270 billion metric tons of carbon to the atmosphere in the form of CO_2. Currently, burning of fossil fuels emits more than 9 billion metric tons of carbon annually. To avoid catastrophic climate warming and also supply the energy necessary to maintain human well-being, we will have to shift away from fossil fuels to renewable sources such as wind and solar. However wind and solar produce power intermittently; biofuels can help bridge gaps in the need for energy and take advantage of existing energy infrastructure.

One strategy Nations across the globe are implementing to meet commitments to reduce their greenhouse gas (GHG) emissions under the Paris Accords is conversion of coal-fired electrical generating plants to burn wood pellets. Much of the wood used is harvested from the southern U.S. In the past 8 years, wood pellet exports from the U.S. to the European Union have increased by over 600% (shipments of wood pellets exceeded 6 million tons last year). Enviva LP is the largest producer and exporter of industrial grade wood pellets in the world.

This approach is not without controversy. Critics argue that burning wood pellets leads to destruction of forests, that it releases more CO_2 per joule of energy produced than coal, is not carbon neutral over the short term, and that harvesting, processing and transporting wood is polluting and requires fossil fuels equivalent to as much as a quarter of the energy derived from the wood itself. Yet industrial scale solutions to the climate crisis are needed. How can we ensure that "green energy" is really green?

As Vice-President and Chief Sustainability Officer at Enviva LP, Dr. Jennifer Jenkins is responsible for ensuring that the wood used to manufacture this biofuel is sourced responsibly. She leads a multi-disciplinary team that works to track wood sourcing and to infuse corporate social responsibility into all aspects of company operations. She interacts a variety of stakeholders, from certification bodies to industry colleagues, regulatory authorities, investors, and conservation groups.

Dr. Jenkins a respected scientist who has worked in forestry and studied global carbon dynamics for more than 25 years. She earned an AB in Environmental Studies at Dartmouth in 1991, a Masters in Forest Science at Yale (1995) and a doctorate in forest biogeochemistry at the University of New Hampshire (1998) under the guidance of professor John Aber. After completing her Ph.D., she worked as Research Forester for the U.S. Dept. of Agriculture until 2002, then took positions as Visiting and Research Professor at University of Vermont (2002-09). She moved to the Climate Policy Branch in the U.S. EPA in 2009 where she spent five years as a Physical Scientist developing methods to assess CO_2 emissions from bioenergy, and managed the annual national GHG inventory based on land use and forestry. She entered the private sector beginning in 2007, serving in leadership capacities at consulting firms specializing in measurement of forest carbon and evaluating GHG inventories and bioenergy applications. She earned an MBA at the University of Maryland R.H. Smith School of Business in 2016 and has been at Enviva LP since.

Over for readings ➔

Readings:

How modern bio-energy helps reduce global warming. *The Economist* *https://www.economist.com/the-economist-explains/2018/10/12/how-modern-bio-energy-helps-reduce-global-warming*

Jenkins, J. (2019). The Carbon Debt Fallacy. *http://www.envivabiomass.com/wp-content/uploads/The-Carbon-Debt-Fallacy.pdf*

Wang, W, P. Dwivedi, R. Abt, M. Khanna (2015). Carbon savings with Transatlantic trade in pellets: accounting for market-driven effects. *Environmental Research Letters* doi:10.1088/1748-9326/10/11/114019