



Message from the Regional Coordinator – Lewis Meixler



Happy New Year, and welcome to the first issue of our newsletter for 2012. The past 12 months brought positive developments to the Northeast Region as more of our laboratories sought partnerships to fully exploit the technologies they worked

tirelessly to create. Federal laboratories are key to the economic health of the regions in which they are based, and reaching out to local partners to advance a “homegrown” technology is a way to help these regions withstand the financial uncertainties that befall too many communities.

There are several events on the horizon that you should place on your calendar. We are planning a spring regional meeting, which will

be informative as well as fun. Details are still being worked out, so be sure to check our website for updates. Then there’s the 2012 FLC national meeting in Pittsburgh. This 3-day event features dynamic speakers; sessions that address different aspects of technology transfer; lively receptions and outings; and, of course, an evening of glamour that is the awards banquet. Since the location is within driving distance for many of you, I hope you will be able to attend to give the Northeast Region a strong presence.

As always, I appreciate your continued support for all we do in the Northeast Region. Our profile has increased tremendously, which would not have been possible without your enthusiasm in being a part of our initiatives. I look forward for even more opportunities to do so in the coming months.

Enjoy the newsletter!

Ribbed Mussels Offer Possible Natural Way to Improve Urban Water Quality

Using a 20-foot by 25-foot mussel raft in New York City’s Bronx River as their field location, researchers from the National Oceanic and Atmospheric Administration (NOAA) Northeast Fisheries Science Center’s (NEFSC) Milford Laboratory in Milford, Conn., have begun a two-year pilot study to test how effectively ribbed mussels (*Geukensia demissa*) can remove nitrogen and other excess nutrients from the water. Scientists are monitoring the condition of the mussels, which are growing on lines hanging below the raft, as well as local water quality over time to see how each responds.

Farming and harvesting shellfish and seaweed to remove nitrogen and other excess nutrients from estuaries and coastal waters is known as nutrient bioextraction, or bioharvesting. Mussels and other shellfish are filter feeders, and as the organisms grow, they take

up or assimilate nutrients in algae and other microorganisms filtered from the surrounding waters. When harvested, the nutrients in the shellfish or seaweed are removed directly from the environment.

The mussel raft study is part of long-term efforts to improve water quality in Long Island Sound. The pilot project will evaluate the potential for mussel aquaculture to increase biological filtration activity in an urban environment. If successful, similar operations could be used elsewhere. Results from the pilot study will also contribute to a system-scale evaluation of bioextraction use for all of Long Island Sound and work to characterize the ecosystem services that would be provided by this approach, such as improvements in water quality, removal of bacteria, and assimilation of nutrients.

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Traditional methods to reduce nutrients include upgrading sewage treatment plants and reducing storm water runoff that carries fertilizer and pet waste from the land into estuaries and coastal waters, thereby reducing water quality. Loss of sea grass, algal blooms and hypoxia, or low oxygen levels in the water, can occur as consequences of over-fertilization. Nitrogen and other nutrients occur naturally in the coastal environment, but too much of any of them is harmful.

In addition to NOAA, project partners include The Long Island Sound Study, which has funded the installation and maintenance of the mussel raft off Hunt's Point in the South Bronx, near the confluence of the Bronx and East rivers. Rocking the Boat, a local youth development organization in the South Bronx, built and installed the raft in the Bronx River with support from Pemaquid Mussel Farms, a commercial shellfish company in Maine. Montclair State College in New Jersey is evaluating the diversity of sea life that will attach to the raft's mussel lines. The National Fish and Wildlife Foundation is providing project management with funding from the New York State Office of the Attorney General. The Environmental Protection Agency is providing funding for the system-scale modeling and ecosystem services work through its Regional Ecosystem Services (REServ) program.

"The open-frame mussel raft with ropes to catch and grow mussels was installed on site August 15 and is monitored on a regular basis," said Julie Rose, a plankton biologist with the Milford Lab's Culture Systems and Habitat Evaluation Branch. "We hoped to get it in the water before the mussels' fall spawning season. It took a while to obtain all the permits and work out all the logistics. The raft itself is located in a pretty interesting place, not far from a large sewage treatment plant but in an area where there is not a lot of traffic on the water or the shoreline. All the action is underwater".



Apparatus to measure mussel filtration at the Bronx River field site. An abandoned waste transfer station is visible in the background. Local water is pumped through the system and across individual mussels, and their feeding activity is measured within each chamber.

Lab staff visit the raft on a regular basis, recently checking lines for natural mussel growth during fall spawning season, which occurs in September. Mussels also spawn in the spring when the water temperatures warm and plankton and other sources of food become more plentiful.

Atlantic ribbed mussels (*Geukensia demissa*) occur naturally in the area and once thrived in local salt marshes and along the shoreline, but as urban development degraded the marshes or eliminated them altogether, fewer ribbed mussels survived. Current mussel populations are too sparse to have the capacity to

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filter microorganisms fertilized by high nutrient levels. Rose is optimistic the raft will be populated by mussels next spring, either with new mussels from the fall/spring spawn or existing mussels populating the local rivers.

“Ribbed mussels have no commercial market,” said Rose. “They aren’t something anyone eats because they have an unpleasant taste, but they may have some future commercial value, such as an alternative chicken or fish feed.”

completed a Ph.D. project at the University of Barcelona in Spain where she developed the innovative apparatus and procedure to quantify mussel filtration activity that she has used this summer in the Bronx River.

Of the ribbed mussels in the Bronx River, Galimany said. “They are dealing with a lot of silt in the water, but seem to be removing the organic fraction pretty effectively.” Several datasondes, an instrument used to monitor water quality, have been measuring such factors as temperature, salinity, oxygen levels, algae and turbidity in the river.



Ribbed mussels inside chambers of the filtration apparatus. Local water is pumped in from the left, then flows directly across each mussel before exiting the chamber on the right. (Credits: Larissa Graham, New York Sea Grant Outreach Coordinator, Long Island Sound Study)

“This project in the Bronx River is one of the first to test the effectiveness of a relatively new technology,” said Gary Wikfors, Milford’s Biotechnology Branch chief and NEFSC project leader for the mussel study. The idea has been successful in other countries, and if the pilot study goes well, shellfish aquaculture for nutrient removal could be applied in many other coastal environments.”

The Milford team conducted an on-site mussel filtration experiment October 21 at the Bronx River location. National Research Council post-doctoral scholar Eve Galimany has been funded by the NOAA Aquaculture Program to work with Milford Lab staff on the mussel-filtration component of the study. Galimany recently

“There is already considerable local interest in and ‘buzz’ about the project,” Rose said. “We don’t have any results yet since the project just got underway. The raft survived Hurricane Irene just days after it was installed in the river, and things have gone well so far, so we’re off to a good start.”



Volpe Scientist Recognized by White House with Early Career Award

The White House recently named John A. Volpe National Transportation Systems Center employee Dr. Kristin C. Lewis as the recipient of the Presidential Early Career Award for Scientists and Engineers. The award is the highest honor bestowed by the U.S. government on science and engineering professionals in the early stages of their independent research careers.

Dr. Lewis distinguished herself by working collaboratively to develop a standard for synthesized hydrocarbon jet fuels, which has since received international approval. She is also recognized for her outstanding leadership coordinating the aviation-related fuels research of 200+ organizations from government, industry and academia.

Dr. Lewis serves as the Head Research and Technical Advisor for the Federal Aviation Administration's Commercial Aviation Alternative Fuels Research Initiative (CAAFI), a coalition that seeks to enhance energy security and environmental sustainability for aviation through alternative jet fuels. "The aviation community is actively researching sustainable alternative fuel solutions. It's an exciting time to be involved in alternative fuels because momentum is really building" she said.

In addition to her work at CAAFI, Dr. Lewis is an active participant in the rich scientific and



Dr. Kristin Lewis

academic community in the Boston area, partnering with researchers at Massachusetts Institute of Technology's Aeronautics and Astronautics Department. She also has strong ties with the Air Force Research Laboratory in Dayton, Ohio, where she is considered a recognized leader in the field.

Prior to joining Volpe Center in 2009, Dr. Lewis worked as a Rowland Junior Fellow in the Ecology Lab at Harvard University, where she received her Ph.D. in Biology in June 2004.

Presidential Early Career awardees are selected for their pursuit of innovative research at the frontiers of science and technology, and their commitment to community service as demonstrated through scientific leadership, public education, or community outreach.

"This recognition from the White House of Kristin's outstanding accomplishments and future promise is very well deserved," said CAAFI Executive Director Richard Altman.

Dr. Lewis is one of 96 awardees and the only recipient from the U.S. Department of Transportation.



New Microscope at Brookhaven Lab Promises Unprecedented Experimental Opportunities in Materials Science

A new class of x-ray photoelectron spectroscopic microscope has been developed at Brookhaven National Laboratory. The microscope will be used for advanced research on a wide range of technologically important materials systems. This new class of microscope was invented by Raymond Browning of R. Browning Consultants and funded by National Institute of Standards and Technology (NIST) Small Business Innovation and Research (SBIR) contracts. A prototype of the new instrument, a vector potential photoelectron microscope (VPPEM), has been built in collaboration with the NIST Synchrotron Methods Group at the laboratory's National Synchrotron Light Source (NSLS).

Currently under construction, NSLS-II will be the most advanced synchrotron light source in the world when it begins operating by 2015.

VPPEM uses x-ray photoelectron spectroscopy to image the composition and chemistry of surfaces. These chemical properties determine the technologically valuable properties of a material, such as resistance to corrosion, usefulness in fuel cells, and also strength and hardness. Such information obtained from VPPEM images can be used for semiconductor device defect analysis, inspection of surfaces used in medical practice, organic photovoltaic materials characterization, novel materials development, and general materials surface and interface analysis.



Dan Fischer (left) and Raymond Browning show off the prototype of the vector potential photoelectron microscope.

The new microscope uses a unique imaging method, and opens up many novel experimental possibilities. According to Browning, VPPEM potentially has a thousand times greater spatial resolution than current technology can provide, and is expected to be the world's most advanced general purpose x-ray photoelectron microscope when combined with NIST's beamline at Brookhaven's new light source, NSLS-II.

The VPPEM is unique because it uses a strong vector potential field created by a superconducting coil rather than a traditional lens system to magnify a sample. The vector potential field, which is a consequence of the electrical current flowing in the coil, forms a symmetric circular field in the center of the coil. VPPEM uses this symmetric field as a two-dimensional map, or spatial reference, for imaging samples.

Browning explained, "Unlike other microscopes, VPPEM does not 'focus' on the sample with a lens system, but magnifies the effects of the vector potential field on the photoelectrons

emitted from the sample. When a sample's surface is irradiated with synchrotron-generated x-rays, the characteristic photoelectron energies emitted from surface atoms give a wealth of information about the type of atoms, chemical bonding and, to a certain extent, the atomic structure of a material. At present, the VPPEM has successfully imaged uncoated silk,

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magnetic steel wool, gold mesh, and micron-sized tungsten wires.”

The VPPEM’s magnifying action has several advantages over conventional electron microscopy. For instance, the sample can be located at different places in the vector potential field and still be imaged. The sample is always in focus because there is no imaging lens to adjust. Relatively large, uneven samples can be imaged in this way, with little sample preparation.

NIST Synchrotron Methods Group Leader Dan Fischer, who has been helping to develop and test the prototype microscope, said, “Since it

automatically focuses, it’s easy to use, and no knowledge of synchrotrons is necessary. Because there is a long working distance between the lens and the sample, other probes and equipment can be placed in the VPPEM, as needed. When fully developed, this microscope will be a flagship instrument in NSLS-II that will enable nondestructive, three-dimensional mapping of nanomaterials and nanodevices.”

Browning holds three patents, and has another three patents pending on the VPPEM. These patents are available for licensing. “I am looking for an industrial partner to develop the microscope and commercialize it,” he said.

R.I. Governor, Congressional Delegation Help NUWC Newport Break Ground for New \$20.7-Million Facility

The Naval Undersea Warfare Center (NUWC) Division Newport broke ground for a new \$20.7 million electromagnetic sensor facility on October 31. R.I. Governor Lincoln Chafee, Senators Jack Reed and Sheldon Whitehouse, and Congressman David Cicilline attended and participated in the groundbreaking.

“This project will result in a significant upgrade to our capabilities,” said Capt. Todd Cramer, Commander of NUWC Newport. “Thanks to the addition of this facility, NUWC will be well-equipped to keep our submarines at the forefront of emerging electromagnetic sensor technologies well into the future.”

When completed, the 54,000-square-foot facility will include six laboratories and a five-story periscope tower designed to repair and certify periscopes, submarine communications

systems, electronic warfare equipment, and imaging/optical systems. The new building will provide space for both personnel and equipment for prototyping, acquisition and production support, as well as in-service engineering and test functions.

“This is important for the Navy,” said Sen. Reed. “With the maritime threats that we face, the ability of submarines to operate without detection close to shore makes them much more valuable than they were at any time in our history.”

The building will also be NUWC Newport’s first Leadership in Energy and Environmental Design (LEED) certified building designed to achieve LEED “new construction” Gold certification. It is expected to be completed by September 2013.



Picatinny Arsenal Sweeps 6 of 10 Greatest Inventions

Innovating. Elegant simplicity. Ease of use.

Army senior science leadership used these words to describe this year's 2010 Army Top Ten Greatest Inventions, or AGI, during an awards ceremony October 11 in Washington, D.C. Picatinny teams swept 6 of the 10 AGIs during the ceremony, making this the installation's most bountiful to date.

Gerardo Melendez, director of the U.S. Army Armament Research, Development and Engineering Center (ARDEC) and representatives from the winning teams accepted the awards on behalf of ARDEC and its counterparts at PEO Ammunition and PEO Soldier.

During the ceremony, Army Chief Scientist Scott Fish compared the work of the winners to Steve Jobs' vision of elegant simplicity and ease of use for Apple products. "They are all driven by a deep desire to make things better. They are not satisfied with a concept of utopia," Fish said. "They go beyond that. They make something real. They make it happen now.

"As you hear about the inventions tonight and applaud those people who made them happen, bear in mind a few phrases that have been used to describe Steve Jobs' contribution and unique approach, and recognize that they apply to our Army's greatest inventions as well—Elegant simplicity. Ease of use. Change the way we do what we do."

Heidi Shyu, acting assistant secretary of the Army for Acquisition, Logistics and Technology, who recently returned from the Middle East, said that improved equipment is making a difference to soldiers. "You are innovating and saving the lives of soldiers," she said. "Anything you do to innovate and help our soldiers is incredibly appreciated by the folks who are deployed. I am so impressed. Thank you for what you do for our soldiers."

The Picatinny winners are:

40mm Infrared Illuminant Cartridge, M992

Soldiers now have the capability to engage the enemy far more effectively during night operations. The Army's new infrared illuminating cartridges/projectiles produce infrared light that is invisible to the naked eye, but is clearly visible through night vision devices that U.S. soldiers use in Iraq and Afghanistan.

5.56mm M855A1 Enhanced Performance Round (EPR)

Since June, the Program Executive Office for Ammunition at Picatinny Arsenal has fielded approximately 30 million new 5.56mm M855A1 EPRs in Afghanistan. The bullet has been redesigned and now features a larger steel penetrator on its tip. A notable feature of the EPR is a bullet with a copper core.

Green Eyes - Escalation of Force Kit Integration with the CROWS System

The system emits a wide band of green light that temporarily disrupts a person's vision so that driving a vehicle or aiming a weapon becomes difficult if not impossible. One application would be to warn civilians away from checkpoints and other areas where their safety is at risk. At closer distances, the lasers provide an immediate, non-lethal capability to deter aggressive actions.

Jackal Explosive Hazard Pre-detonation System

The Jackal is an improvised explosive device, or IED, defeat system designed to remove the threat of IEDs against soldiers, tactical vehicle platforms, and overall mission success. In 2010, ARDEC developed and fielded Jackal to

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soldiers throughout Iraq to counter roadside bombs. In particular, Jackal neutralizes the lethal IED threats that put soldiers at risk during route clearance and convoy missions.

Jackal keeps soldiers outside the IED's area of lethality and increases the survivability of vehicle platforms. Unlike its predecessors, Jackal is designed to be modular and adaptable to new and emerging IED devices.

M240L 7.62mm Lightweight Medium Machine Gun

This new machine gun reduces the weight of the existing M240B without compromising reliability. "The titanium M240L represents a leap in weapons technology inspired by soldier feedback," said Col. Douglas Tamilio, former Project Manager Soldier Weapons for PEO Soldier. "The

lessons learned from this program will undoubtedly benefit future weapons systems that will maintain our continued advantage on the battlefield."

Mortar Fire Control System

Dismounted—The MFCS-D reduces the time to fire a first round from eight minutes during the day and 12 minutes at night to less than two minutes for both day and night. The kit consists of ruggedized computers, battery power supplies, displays, navigation and pointing hardware, and associated mounting hardware. The system enhances the responsiveness of the M120A1 120mm Towed Mortar System, enabling digital coordination of multiple systems and significantly reducing the time required to place, fire, and move the weapon.