

## FLC NORTHEAST REGION NEWSLETTER – FALL 2009

### **2009 Northeast Regional Award Winners Honored**

The Northeast Region presented its annual awards on September 16 at the Princeton Plasma Physics Laboratory in New Jersey. Three awards were presented for both outstanding team and individual achievements in technology transfer. This year's recipients included:

#### ***Franklin Hoke, Air Force Research Laboratory Information Directorate Regional Coordinator's Excellence Award***

Franklin Hoke, Jr. of the Air Force Research Laboratory Information Directorate (AFRL/RI), located in Rome, N.Y., received the Regional Coordinator's Excellence Award in recognition of his significant contributions to the FLC program. In his role as the primary technology transfer lead for AFRL/RI, Hoke has developed a number of technology transfer initiatives that are novel and highly productive. As a recognized intellectual property rights expert within AFRL, especially with regard to software, Hoke has come up with processes that ease the transfer of pertinent technology to and from the civilian sector. Among his innovations is the Special Cooperative Research and Development Agreement (CRADA) for Software Use, which has been adopted by AFRL and other DOD organizations.

Another example of Hoke's leadership is the successful acceleration of technology transfer capabilities between the AFRL/RI Information Institute and the National Law Enforcement and Corrections Technology Center – Northeast Region (NLECTC-NE), part of the National Institute of Justice's Office of Science and Technology. Since Hoke became Director of the NLECTC-NE in 2008, the Center has increased its transfer of Air Force technologies by 30% over the previous 13 years of its existence. Hoke has developed a broad-based approach to technology transfer not just centered on technology push, but also on the integrated view of technology and opportunities. Through his efforts, technology needs in law enforcement are now a major factor in the research process.

#### ***John A. Volpe National Transportation Systems Center Regional Laboratory Award***

The John A. Volpe National Transportation Systems Center, located in Cambridge, Mass., was the recipient of the Regional Laboratory Award in recognition of its extraordinary efforts, which exceed legislated requirements, in the furtherance of national and regional technology transfer activities. Part of the Department of Transportation, Volpe Center is an internationally recognized federal center of research and technology development and deployment for transportation logistics and expertise in safety, and economic competitiveness.

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In the past year, the Volpe Center has excelled in regional, national, and global technology transfer efforts. Among the Center's accomplishments are the development of hardware and software that enable remote tracking, communication and display of the a ship's location and its identification information; an Intelligent Transportation System (ITS) initiative that leverages the synergy of widely used current technologies to ultimately improve transportation safety and convenience, as well as economic productivity; and an integrated vehicle-based safety system for both light vehicle and heavy truck platforms that warns drivers of imminent crash situations, thus helping to prevent rear-end, lane-change, and road-departure crashes.

### ***“RAPT-R Automated Audio Transcription and Reporting System” Air Force Research Laboratory Information Directorate Excellence in Technology Transfer Award***

Researchers at AFRL/RI won an Excellence in Technology Transfer Award for their development and commercialization of RAPT-R (pronounced Raptor), an automated audio transcription system that performs basic audio player functions while providing advanced analytical and manipulation abilities via modular, upgradeable technologies. RAPT-R allows the user to load and save audio in a variety of different formats, and provides general audio editing tools that include cut, copy, paste, and undo.

The technology is in the process of being transferred via a Cooperative Research and Development Agreement between AFRL/RI and the National Transportation Safety Board for use as a transcription technology for its investigators.

The Northeast Region congratulates the winners on a job well done.

### **Northeast Region Fall 2009 Meeting Review**

Presentations covering a wide variety of topics, social networking, and an awards presentation were just a few of the happenings that took place at the FLC Northeast Region's fall 2009 meeting. The three-day event, which was held at New Jersey's Princeton Plasma Physics Laboratory (PPPL) September 14-16, kicked off with an evening reception that allowed attendees to relax with their fellow technology transfer professionals.

The first full day of the meeting started with a formal welcome to Princeton University, home of PPPL, and continued throughout the morning with informative discussions emphasizing different aspects of homeland security, including cybercrime awareness, security preparedness, and rapid response. The afternoon session focused on technologies successfully developed at federal laboratories in the Region, including the 2009 FLC Excellence in Technology Transfer winner, the Miniature Integrated Nuclear Detector System (MINDS), which was invented at PPPL.

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The second and final day featured the presentation of the 2009 Northeast Regional awards, and installation of Lewis Meixler of PPPL as the new Regional Coordinator and Michael Furey of Brookhaven National Laboratory as Deputy Regional Coordinator. A tour of PPPL served as the final event of the conference.

Proceedings of the meeting and a photo gallery are available for viewing at [www.flcnortheast.org/](http://www.flcnortheast.org/).

### **Trapped! Brookhaven Scientists Immobilize Bacteria in Fibrous Hydrogel**

Bacteria play a role in myriad industrial processes from fermentation to cleaning up environmental pollution. But floating freely in solution, the microbial cells constantly multiply, generating biomass that must be removed periodically, causing downtime. Additionally, the microorganisms cannot be localized to a specific region of interest. Now, scientists at Brookhaven National Laboratory (BNL) and Stony Brook University have devised a way to encapsulate bacteria in a synthetic polymer hydrogel. These new, stable, bio-hybrid materials maintain the microbes' ability to exchange nutrients and metabolic products with their environment, and could find widespread applications as biosensors, catalysts, drug-delivery systems, or in wastewater treatment. The method and results are described in a paper published online in the *Proceedings of the National Academy of Sciences* the week of August 3, 2009.

“In many ways, our research is trying to mimic the biofilms many microorganisms form in nature,” said BNL materials scientist Dev Chidambaram, corresponding author on the study. “These complex and dynamic communities form when microbes encapsulate themselves in an extracellular polymer matrix, which offers them considerable protection from environmental challenges such as changes in acidity or salinity, and even antimicrobial agents.

“Our goal is to develop synthetic biofilms, in the form of bioactive materials that could be produced reliably on an industrial scale, and used or reused continuously for a range of applications. This study, which reports the generation of a very thin polymeric fibrous material in which microbes maintain their ability to function, represents a significant step toward achieving that goal.”

Previous attempts to encapsulate viable bacteria in insoluble materials suffered from several shortcomings, according to the researchers. Foremost, the encapsulating materials were usually orders of magnitude larger than thin films. Because nutrients or reactants had to diffuse far into these materials to reach the microbes, activity—and microbe viability—suffered as a consequence.

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To overcome these problems, the BNL-Stony Brook team used a technique called electrospinning, which uses electrostatic force to produce polymer filaments. In this process, a polymer solution containing the microorganism of interest is spun to create fibers.

One challenge was developing a polymer-solvent system that would not be toxic to the bacteria. Another was achieving a structure with enough porosity to facilitate the transfer of materials such as nutrients and waste products between the microbes and their environment. Additionally, the final material must be made insoluble so it would remain intact in the watery environments envisioned for many potential applications.

The scientists met these challenges through a series of experiments to develop a method for producing their fibers. They achieved their objective—an insoluble, fibrous polymeric material in which industrially relevant bacteria were successfully encapsulated and remained viable—using a nontoxic, non-biodegradable, water-soluble polymer known as FDMA as the encapsulating agent, and by cross-linking the fibers in a glycerol solution after encapsulation to prevent the material from dissolving in aqueous environments.

Scanning electron microscope and fluorescent microscopy images revealed the rod-shaped bacteria completely encased within the tiny polymer fibers. The fibers form a mesh-like random weave with an open pore structure ideal for use as electrodes, membranes, or filters. Additional tests showed that a high percentage of the bacteria remained viable for up to several months, and their metabolic activity was not affected by immobilization. Yet the encapsulated bacterial cells do not replicate; therefore, no removal of accumulated biomass would be necessary.

The bacteria chosen for this study—from the genera *Pseudomonas*, *Zymomonas*, and *Escherichia*—already have industrial applications, such as fermenting glucose to produce ethanol (a key reaction of biofuel production from plant matter). Insoluble materials containing such bacteria also could be used to develop sophisticated, reusable biosensors, stable drug-delivery systems, and permeable reactive barriers for cleaning up contaminated groundwater.

In addition to Chidambaram, collaborators on the research described in the *Proceedings of the National Academy of Sciences* paper are: Ying Liu and Miriam Rafailovich of both the Advanced Energy Research & Technology Center (AERTC) and Stony Brook University, and Ram Malal and Daniel Cohn of The Hebrew University of Jerusalem. A patent application has been filed for this method of producing biohybrid hydrogels, as well as various applications. Those interested in licensing the technology should contact Dorene Price, 631-344-4153, [price@bnl.gov](mailto:price@bnl.gov).

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### NEFSC Scientists Conduct Shark Survey Off U.S. East Coast

Sandbar, dusky, and tiger sharks are among dozens of shark species living in the coastal waters off the U.S. East Coast. Little is known about many of the species, but a survey begun nearly 25 years ago is helping scientists and fishery resource managers monitor shark populations and their role in marine ecosystems.

National Oceanic and Atmospheric Administration (NOAA) scientists from the Northeast Fisheries Science Center (NEFSC) lab in Narragansett, R.I., recently conducted their ninth coastal shark survey from Florida to Delaware. The survey, conducted every two to three years, is the longest survey—independent of the fishing industry—of large coastal sharks in the U.S. Atlantic Ocean.

Using commercial Florida-style longline fishing methods to standardize results from survey to survey, researchers caught 1,675 sharks from 19 different species and tagged 1,352 during the 2009 survey in April and May. Most of the animals caught and tagged were sandbar sharks, a common species in the western Atlantic. Longline fishing is a type of fishing that uses a long or main line with baited hooks spaced at certain intervals along the line.

“During the survey, we often catch 19 or more species, many of which are highly migratory, and we still have a lot to learn about them,” said Nancy Kohler, who heads the Apex Predators Program at the Narragansett Lab and has participated in every survey. “We do not know how large certain species are when they mature, for example. It is important that we obtain basic biological information from the fish we catch so that we can learn as much as possible about their life histories, or the changes that the animals undergo from birth to death.”

Researchers record the length, sex and location of each shark caught before the fish is tagged and released. The sharks can range from one foot to 15 feet; they are not weighed. Any dead fish are carefully dissected at sea, with researchers looking for parasites; collecting DNA and blood samples; and obtaining samples for studies of age and growth, reproductive biology, and food habits.

The first systematic survey of Atlantic sharks was conducted by the Apex Predators Program in 1986 between Florida and southern New England waters from five to 200 meters deep (about 16 to 660 feet). In addition to basic biological information, researchers gather data on shark abundance, and distribution and migration patterns.

Kohler said the survey is conducted in the spring because coastal shark species distributions are concentrated during this time of year since the waters north of Delaware are too cold, thus making it easier to survey the whole population. Nearly all of the surveys have been conducted from the NOAA ship *Delaware II*, based at NEFSC's Woods Hole Laboratory.

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“We caught more fish and tagged more fish on this survey than any other,” said Lisa Natanson, who heads the coastal survey effort and has been on all but one of the surveys. “The previous high total was in 1998, when we caught 917 sharks and tagged 859. Some years we catch very few, so it really varies.” In addition to numerous sandbar sharks, the researchers also caught one great white, many tiger and dusky sharks, and some Atlantic sharpnose. The current data are part of just one of several long-term data sets that are used to determine the health of shark populations.

The survey takes six weeks to complete and is divided into three legs, each approximately two weeks long. Eight scientists are on board for each leg, and fishing is conducted around the clock. Environmental information, such as water temperature and ocean chemistry, is obtained at each station. Survey data are provided to fishery managers, who monitor populations in the Atlantic Ocean and the Gulf of Mexico. The NOAA Fisheries Service manages the commercial and recreational shark fisheries in U.S. waters, including the Caribbean Sea and the Gulf of Mexico. The United States began regulating shark fisheries in 1993 and currently manages 39 species. A fishery management plan that includes sharks, swordfish, and tuna went into effect in 1999, regulating sharks under a catch limit and quota system.

In addition to the coastal shark survey, Kohler, Natanson and colleagues in the Apex Predators Program work with thousands of volunteers throughout the Atlantic Ocean, Gulf of Mexico and the Mediterranean Sea through the Cooperative Shark Tagging Program. The lab also manages and coordinates the Cooperative Atlantic States Pupping and Nursery Survey, collaborating with researchers in coastal states from Rhode Island to Florida to conduct a comprehensive and standardized investigation of shark nursery areas.

Scientists in the program conduct life history studies of commercially and recreationally important shark species, participate in and conduct a variety of research cruises, and often go aboard commercial vessels to obtain biological samples from the catch as well as to tag sharks. Biological samples are also collected from recreational fishing tournaments in the northeast U.S.

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### **DOT Secretary LaHood Visits Volpe Center**

Department of Transportation (DOT) Secretary Ray LaHood toured the Volpe Center in Cambridge, Mass., on August 17, accompanied by Peter Appel, head of the Research and Innovative Technology Administration (RITA). Throughout the morning, Secretary LaHood engaged with staff regarding the Volpe Center's expertise in performing cutting-edge research and deploying beneficial technology in the areas of railroad and transit safety, livable communities, global maritime domain awareness, distracted driving, NextGen, and air traffic flow management. He also hosted a town hall meeting with Volpe Center and DOT regional staff. Congressman Michael Capuano attended the town hall meeting and reiterated his interest in promoting the Volpe Center's role as a leader in innovative transportation.

### **NUWC - Division Newport Breaks Ground on New Sensors Lab**

Military and civilian officials of the Naval Undersea Warfare Center (NUWC) - Division Newport and their guests gathered under threatening skies on July 31 to break ground on an \$11-million project that will centralize all research, development, acquisition, testing, refurbishment, and maintenance of U.S. Navy towed sonar array systems in Newport. The Maritime Subsurface Sensor Operations Laboratory will be a 40,000-square-foot, single-story addition to the NUWC Newport campus. The facility will house a variety of unique, one-of-a-kind equipment used to maintain these systems.

Much of the equipment in the new facility will relocate to Newport from a Space and Naval Warfare Command facility in Virginia, part of the overall Base Realignment and Closure (BRAC) legislation in 2005 to relocate all maritime subsurface sensors functions within the U.S. Navy at NUWC Newport.

“The BRAC commission recognized that co-locating repair and overhaul work with the engineers involved with the design and acquisition of new and upgraded systems will result in synergies to improve quality and service to the Navy fleet,” said Capt. Michael Byman, Commander, NUWC Newport.

“When completed, the combination of existing labs and the new facility will be the U.S. Navy’s only facility capable of providing development and full life cycle support of towed arrays for both submarines and surface ships,” said Dr. Paul Lefebvre, NUWC Newport Technical Director.

The groundbreaking ceremony rounded out a week of special activities marking the 140<sup>th</sup> anniversary of the establishment of the Newport Torpedo Station in 1869. “It is appropriate that as we celebrate our 140<sup>th</sup> birthday, we see the evidence of new national investment in a facility that will help maintain the United States Navy’s preeminence in undersea technology,” said Byman.

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The architect/engineer for the project is Edward Rouse Architects of Providence. H. V. Collins Company, Inc., also of Providence, was selected as the general contractor. “H.V. Collins Company first worked at Naval Station Newport over 60 years ago, during World War II. We greatly appreciate the opportunity to continue our tradition of success here,” said Patrick Collins, Vice President.

In addition to NUWC Division Newport officials and employees, guests at the ceremony included members of the NUWC headquarters leadership; representatives of Department of the Navy research, development and acquisition (RD&A); program sponsors in Washington; and area staff representing U.S. Senate and House members from Rhode Island and southeastern Massachusetts.

“The personnel who currently work on towed arrays in Newport have a well-deserved reputation for excellence,” said Lefebvre. “I am confident that this laboratory will help us remain on the cutting edge of undersea technology.”

### **Benefits of Compound in Turmeric Spice Studied**

There may be a new way to spice up your weight loss routine, according to results from a new animal model study by Agricultural Research Service (ARS)-funded scientists and colleagues.

The researchers theorized that dietary curcumin could stall the spread of fat-tissue by inhibiting new blood vessel growth, called angiogenesis, which is necessary to build fat tissue. Curcumin is a bioactive component in curry and turmeric that has been consumed daily in Asian countries for centuries without reported toxic effects.

The study was led by nutritionist Dr. Mohsen Meydani at the Jean Mayer USDA Human Nutrition Research Center on Aging (HNRCA) at Tufts University in Boston, Mass. Dr. Meydani is director of HNRCA's Vascular Biology Laboratory.

Eighteen mice were assigned to three groups of six mice. For 12 weeks, the mice were fed special diets. A “control” group’s mix contained four percent fat, a “high fat” group’s mix contained 22 percent fat, and another group was fed the same “high fat” diet supplemented with curcumin. A mouse typically eats about 3,000 to 3,500 milligrams (the weight of about six or seven paper clips) daily, so the curcumin-supplemented mice would have consumed about 1.5 to 1.75 milligrams of curcumin daily—a relatively small amount.

The researchers recorded the body weight and food consumption of the mice twice each week. At the end of 12 weeks, their total body weight and fat distribution were measured.

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The study found that supplementing the animals' high-fat diet with curcumin reduced body-weight gain and total body fat, even though food-intake was not affected, when compared to the nonsupplemented high-fat-diet group. The curcumin-treated group also had less blood vessel growth in fat tissue. Blood glucose, triglyceride, fatty acid, cholesterol and liver fat levels also were lower.

At this time, it is not known whether the amount of curcumin normally present in food dishes prepared with turmeric is sufficient to inhibit complex fat-tissue secretions that are involved in recruiting new blood vessel growth. The researchers' next step is to determine the effectiveness of dietary intake of curcumin in reducing weight in humans.

The study results were published in the May 2009 issue of *The Journal of Nutrition*.