

MAKING WAVES

at the University of Maine Darling Marine Center



DMC Going Strong in the 21st Century

In the four decades since Ira C. Darling donated his gentleman's farm to the University of Maine for use as a marine laboratory, the realm of marine research and education has changed at an amazing rate. The DMC continues to evolve with the discipline maintaining it's position as a world class marine laboratory.

Facility Improvements

■ The National Science Foundation (NSF) funded a new CTD and water sampling system for the R/V *Ira C.*, and the installation of a jib crane on the DMC pier.

■ Funding from the Maine Technology Asset Fund (MTAF) is being used to enhance our waterfront aquaculture facilities. The Maine Aquaculture Innovation Center will relocate to this space in early 2010.

New Personnel

■ Dr. Rick Wahle joins the ranks of the School of Marine Sciences faculty and is based at the DMC. His expertise in Gulf of Maine fisheries science brings a multidisciplinary perspective to invertebrate biology research at the DMC.

■ Dr. Ivona Cetinic joins Dr. Mary Jane Perry's lab as a postdoctoral fellow.

■ Carla Companion and Medea Steinman join the COSEE-OS office.

New Users

The DMC welcomes visitors! In 2009, four institutions participated in our Visiting College Field Trip Program for the first time:

- Simmons College
- Wayne State University
- Mulhenberg College
- Kennebec Valley Community College

New Collaborations

■ The Ocean Classroom Foundation SEAmester is now accredited by UMaine!

Building on Success

Many of our users are repeat customers. Having attended a conference or workshop, they often return with students in tow for a field trip or research visit. Come to the DMC once and there a good chance you'll return!



2010 COURSES & WORKSHOPS

■ **Ecology of Marine Sediments.** May 12-28. A multidisciplinary examination of factors controlling ecological processes in marine sediments. Dr. Pete Jumars & Dr. Sara Lindsay.

■ **Shellfish Mariculture Techniques.** May 24-28. Five-day course exploring the theory and practice of marine bivalve aquaculture in the Northeastern United States. Dr. Chris Davis.

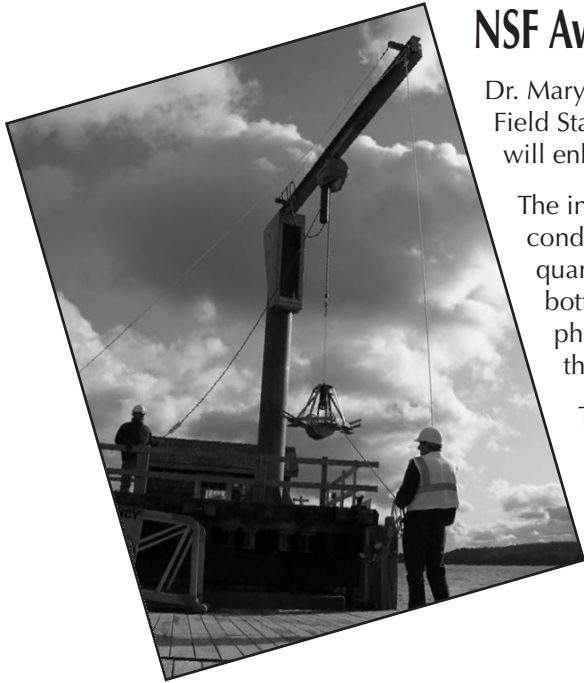
■ **Developmental Biology Teaching Workshop.** June 15-18. Four-day hands-on workshop for college-level instructors of developmental biology wishing to diversify their laboratory lessons. Dr. Leland Johnson & Dr. Eric Cole.

■ **Natural Science Illustration.** July 19-23. An introduction to the close observation, analysis and illustration of natural objects and species. David Wheeler.

■ **Introduction to Research Diving.** Fall 2010. A semester course for divers who want to hone their SCUBA skills in preparation for underwater research. Chris Rigaud.

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**OVER THE LAST 5 YEARS
THE DMC WELCOMED 12,063 VISITORS**



NSF Award Provides New Oceanographic Gear

Dr. Mary Jane Perry received funding from the National Science Foundation's (NSF) Field Stations and Marine Laboratories program for a new water sampling system that will enhance the research and educational use of DMC's research vessel, the R/V *Ira C.*

The integrated water sampling and electronic array includes a CTD for measuring conductivity, temperature, density, and optical sensors to measure the quality and quantity of light in sea water. It is also equipped with a small set of water sampling bottles. The new equipment will be of obvious benefit to biological oceanographers, both from UMaine and from outside institutions, and will likely increase the ocean literacy of students of all ages.

The award also included funds for the installation of an 18' jib crane on the DMC pier. Capable of lifting 2000 pounds, the crane makes loading heavy oceanographic equipment easier and safer. In addition to the CTD, the crane will be used for some of the GoMOOS buoy and mooring deployments, side scan sonar apparatus, and bottom sampling gear.



Aquaculture Incubator Improvements

Dr. Chris Davis, Executive Director of the Maine Aquaculture Innovation Center (MAIC) received funding from the Maine Technology Asset Fund (MTAF) in 2009 to enhance the aquaculture facilities and promote innovative aquaculture business ventures at the DMC. MAIC was one of 16 recipients sharing a total of \$25 million dollars of bond funds approved by Maine voters.

MAIC oversees the Maine Aquaculture Business Incubator located at the DMC. The incubator currently consists of two flowing seawater laboratories with access to the university's shellfish hatchery including continuous algal culture facility, larval culture systems, a quarantine brood-stock facility, and juvenile grow-out systems. The MTAF grant will fund the construction and out-fitting of approximately half of the second floor of the adjacent Marine Culture Laboratory with dry labs/offices for incubator tenants, hatchery staff, aquaculture graduate students and the MAIC.

Pew Fellows Meet in Maine

The Pew Fellows in Marine Conservation address critical marine conservation issues in the United States as well as in Europe, Australia, and Antarctica. They met in Maine in October to focus on the problems of the health and future of the Gulf of Maine and people who depend on it. About 100 Pew Fellows from around the world attended the meeting including Dr. Bob Steneck and Dr. Les Watling (UMaine Emeritus), Pew Fellows of Marine Conservation since 1998.

Bob presented one of two plenary talks entitled: Gulf of Maine's Past, Present and Future. Other workshops involved climate change and the arctic, science and policy, marine spatial planning, risk assessment for decision making, and new ways to manage fisheries.



MAKING WAVES

is the annual newsletter of the University of Maine Darling Marine Center.

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A Shellfish Sabbatical

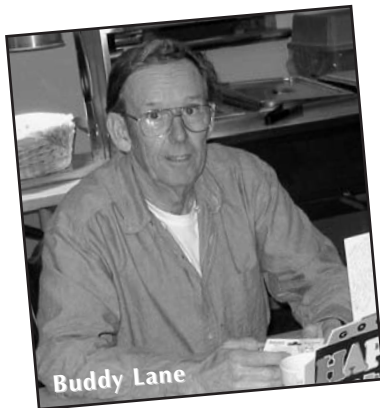
Dana Morse, Extension Associate for Maine Sea Grant, hasn't been in his office the last six months. Rather, he's been on sabbatical, exploring shellfish aquaculture from Maritime Canada to the mid-Atlantic states, concentrating on scallop stock enhancement and aquaculture, and the experiences of fishermen becoming involved in shellfish aquaculture.

Through site visits and personal interviews Dana has been gathering information that may be useful to Maine fishermen and shellfish growers, as well as scientists and managers dealing with shellfish. Two thirds of the way through his sabbatical, Dana is pleased to report that "lessons learned include the fact that in general, Maine does a pretty good job of producing and selling its shellfish, in accord with good environmental and social practices. We grow top-shelf products that enjoy good prices in the marketplace."

When he returns to work in 2010, Dana will meet with industry representatives and UMaine researchers to share ideas for new aquaculture initiatives. Ideas which include educational opportunities for shellfish farmers, research opportunities within the scallop fishery and aquaculture industry, as well as new collaborations with other parts of the university namely marine policy and food sciences.



Dana Morse



Buddy Lane

Thanks Buddy, for 35 years!

Buddy Lane retired from the Darling Marine Center on June 1, 2009. He began work at the DMC in 1973, less than seven years after Ira C. Darling donated his farm to the University of Maine. Buddy helped transform many of the farm buildings into laboratories, classrooms and offices. He also kept the seawater flowing; a task that grew in size and complexity over the years. The ever-flowing seawater supported the research of hundreds of scientists, faculty and students. Buddy, thanks again for your loyal service; we wish you a long and happy retirement!

Recent Publications

- Blake, J.A., J.P. Grassle and **K.J. Eckelbarger**. 2009. *Capitella teleta*, a new species designation for the opportunistic and experimental *Capitella sp. 1*, with a review of the literature for confirmed records. *Zoosymposia* 2:25-53.
- Hetzinger, S., J. Halfar, A. Kronz, **R. Steneck**, W. Adey, P. Lebednik, B. Schone. 2009. High-resolution Mg/Ca ratios in a coralline red alga as a proxy for Bering Sea temperature variations from 1902-1967. *Paleos*. 24:406-412.
- Hodgson, A.N., **K.J. Eckelbarger** and C.M. Young. 2009. Sperm ultrastructure and spermatogenesis in the hydrothermal vent gastropod *Rhynchopelta concentrica* (Peltospiridae). *Journal of Molluscan Studies* 75:159-165.
- Jones, G.P., G.R. Almany, G.D. Russ, P.F. Sale, **R.S. Steneck**, M.J.H. van Oppen, B.L. Willis, D.H. Williamson. 2009. Larval retention and connectivity among populations of corals and reef fishes: history, advances and challenges. *Coral Reefs*: DOI: 10.1007/s00338-009-0469-9.
- Jones, G.P., G.D. Russ, P.F. Sale, **R.S. Steneck**. 2009. Theme section on "Larval connectivity, resilience and the future of coral reefs." *Coral Reefs* 28:303-305.
- Keller, B.D., D.F. Gleason, E. McLeod, C.M. Woodley, S. Airame, B.D. Causey, A.M. Friedlander, R. Grober-Dunsmore, J.E. Johnson, S.L. Miller, **R.S. Steneck**. 2009. Climate change, coral reef ecosystems, and management options for marine protected areas. *Environmental Management*. DOI: 10.1007/s00267-009-9346-0.
- Mayer, L.M.**, L.L. Schick, T.S. Bianchi, and L.A. Wysocki, 2009. Photochemical changes in chemical markers of sedimentary organic matter source and age. *Marine Chemistry* 119:123-128.
- Mayer, L.M.**, L.L. Schick, and M.A. Allison. 2008. Input of nutritionally rich organic matter from the Mississippi River to the Louisiana coastal zone. *Estuaries and Coast* 31:1052-1062.
- Mayer, L.M.** L.L., Schick, **K.R. Hardy**, and **M.L. Estapa**. 2009. Photodissolution and other photochemical changes upon irradiation of algal detritus, *Limnology and Oceanography*, 54:1688-1698.
- Perkins, H.T.**, J.W. Book, F. de Strobel, L. Gualdesi, E. Jarosz, and W.J. Teague. 2009. The Barny Program: fourteen years of NURC-NRL collaboration. NURC Technical Report, NURC-SP-2009-001, May 2009. Available on line at: <http://www.nurc.nato.int/publications/pubs/2009/NURC-SP-2009-001.pdf>.
- Steneck, R.S.** 2009. Marine Conservation: Moving beyond Malthus. *Current Biology*, 19:R117-R119.
- Steneck, R.S.**, C.B. Paris, **S.N. Arnold**, M.C. Ablan-Lagman, A.C. Alcalá, M.J. Butler, L.J. McCook, G.R. Russ, P.F. Sale. 2009. Thinking and managing outside the box: Enlarging the footprint and coalescing connectivity networks for the resilience of coral reef ecosystems. *Coral Reefs*. DOI: 10.1007/s00338-009-0470-3.
- Stephenson, E.H.**, **R.S. Steneck**, and R.H. Seeley. 2009. Possible temperature limits to range expansion of non-native Asian shore crabs in Maine. *Journal of Experimental Marine Biology and Ecology*. DOI: 10.1016/j.jembe.2009.04.020.
- Wagai, R., **L.M. Mayer**, and K. Kitayama. 2009. Organic coverage of soil mineral surfaces along an organic matter accretion gradient. *Geoderma* 149:152-160.
- Wagai, R., **L.M. Mayer**, and K. Kitayama. 2009. Nature of "occluded" low-density fraction in soil organic matter studies: a critical review. *Soil Science and Plant Nutrition* 55:13-25.



Wayne State University students prepare to board the R/V Ira C.

Marine Science Field Trips to the DMC

The Darling Marine Center is one of only 50 university-associated marine laboratories in the United States. We are happy to serve as a field station for both UMaine and outside institutions, and encourage professors to make use of our facility by adding a field trip to their marine science syllabus.

Geographically, we draw marine science classes from across Maine, New England, and the midwest. Smith College (MA), Brown University (RI), Unity College (ME), and Baldwin Wallace College (OH) return annually for weekend field trips that include a sampling cruise aboard the R/V *Ira C.*, intertidal specimen collection trips, and laboratory time for identifying organisms in our flowing seawater classroom. Some groups conduct individual experiments along the coast or in our wet labs.



Dr. Erika Iyengar instructs Mulhenberg College students in a flowing seawater classroom.

A few middle and high school teachers have adapted the basic field trip model for their students. The Ocean Science Bowl team from Conval High School (NH) visits each fall in preparation for the regional Nor'Easter Bowl and the Village School for Children (NJ) make a biennial trek to the DMC for their 7th/8th grade class trip.

OVER THE LAST 5 YEARS

1484 undergraduates and their professors participated in the DMC's Visiting College and University Field Trip Program.

4550 students in grades K-12 participated in academic programs and science camps at the DMC.



Sanford High School Nor'easter Bowl team aboard the R/V Ira C.

In 2009, the DMC welcomed first-time use by four institutions. Dr. Akiko Okusu and marine biology students from Simmons College (MA) spent the long Patriots Day weekend at the DMC.

Geology and Environmental Studies students led by Dr. Larry Lemke from Wayne State University (MI) made a 2-day stop at the DMC on their department field trip to the Bay of Fundy.

Dr. Erika Iyengar, Mulhenberg College (PA), taught her two-week field marine biology course on site at the DMC.

Dr. Dean Pakulski designed a new introductory marine science course, complete with DMC field trip, for his students at the Kennebec Valley Community College (ME).

A SALTY ADVENTURE STUDENTS NEVER FORGET!

A weekend field trip for 15 students and one professor costs less than \$2200.

A typical field trip includes: half-day sampling cruise aboard the R/V *Ira C.*, intertidal collecting trips, access to flowing seawater classroom with microscopes for specimen identification, two nights lodging and meals. Custom field trips can be arranged to accommodate extended stays or specific syllabus goals.



BSC 7th graders Chad Hammond (left) and Shawn Burns (right)

Bristol Consolidated School @ the DMC

Shawn Burns and Chad Hammond, students in Kevin Craft's science class at the local Bristol Consolidated School (BCS), conducted research for their 7th grade science project at the DMC. They made weekly visits to the DMC to conduct shelter experiments with lobsters under the guidance of Tim Miller, laboratory manager. Their visits included feeding the lobsters, maintaining aquaria and developing experimental designs to determine shelter size and structure preferences.

BCS science teacher Kevin Crafts returned to the classroom as a student this spring. He participated in the DMC's Developmental Biology Teaching Workshop.



Kevin Crafts, BCS science teacher

Though the workshop is geared toward undergraduate college instructors, Kevin was sure that many of the activities could be scaled down to the secondary level. He wasted no time incorporating the new skills, techniques and knowledge into his science curriculum. Within a week, Kevin's 7th grade students studied worm regeneration using an experiment learned at the workshop.

Course instructor, Dr. Leland Johnson, described Kevin as a "highly motivated secondary school teacher" adding he continues to be inspired by public school teachers like Kevin who take the initiative to learn more for their students and who share the knowledge with their colleagues.

DBTW WILL BE OFFERED JUNE 15-18, 2010
WWW.DMC.MAINE.EDU/COURSES.HTML



Young ROV pilots handle the controls and scan the seafloor for marine life and signs of human activity.

OceansWide Campers Scour the Seafloor

The DMC is home base for the popular OceansWide Inc. summer camps. The 5-day camps provide budding marine scientists ages 8-14, with exposure to flora and fauna of the marine environment and an introduction to the technology scientists use to study the ocean. Campers build and "fly" their own remotely operated vehicles (ROVs) from kits of PVC pipe, cables, joy sticks, and battery operated lights and thrusters. Then, aboard the R/V *Ira C.*, campers pilot a professional ROV rigged with a video camera that shoots images to a shipboard monitor for a real look at the seafloor.

OceansWide founder Campbell "Buzz" Scott is active in area schools too, teaching students about the underwater world with video taken during his time aboard research vessels and in Antarctica. He has also given presentations to some of our visiting college groups and summer workshops. Most recently he spoke with a group of students from Northern Ireland participating in a Rotary Youth Exchange program. Next summer, OceansWide plans to offer family camps in addition to their the day camp programs for kids.

WWW.OCEANSWIDE.ORG



Students from Northern Ireland build ROVs at the DMC.

Visiting Scientist becomes UMaine Faculty

The DMC is pleased to welcome Dr. Rick Wahle, the newest Research Associate Professor in University of Maine's School of Marine Sciences.

From graduate student to visiting investigator to faculty, Rick's career has been linked to the DMC almost every step of the way. He first set foot on the DMC campus in 1985 when he began his Ph.D. studies with Dr. Bob Steneck. After postdocs at Brown University and the University of Rhode Island, Rick became a research scientist at the Bigelow Laboratory for Ocean Sciences, in West Boothbay Harbor, Maine. During his years at the Bigelow Lab, Rick maintained his connection with the DMC as a visiting investigator, taking advantage of our scientific diving program and flowing seawater facilities every summer.



Dr. Rick Wahle & Katherine Thompson



Charlene Bergeron ready to dive

Rick's research focuses primarily on the American lobster, *Homarus americanus*, though he has also worked on urchins, crabs and most recently scallops (see story below). His research integrates the fields of ecology, oceanography and fisheries science, and is highly collaborative in nature. Working with scientists, fishermen and industry representatives from across New England and maritime Canada, Rick's investigations provide a comprehensive look at the early life history of the lobster and explores the biotic and abiotic processes that affect the annual recruitment and ultimately the strength of the fishery.

Rick is also active as an academic mentor. He has been a member of UMaine's graduate faculty since 1995, and is currently advising two graduate students in the School of Marine Sciences: Charlene Bergeron who is working on a lobster growth rate model and Mahima Jaini who is looking at environmental factors influencing lobster settlement.

Sea Scallop Studies

Julien Gaudette, Department of Fisheries and Oceans, New Brunswick, Canada, and Dr. Rick Wahle worked in the Flowing Seawater Laboratory this summer to evaluate fertilization dynamics of the sea scallop, *Placopecten magellanicus*.

Although the sea scallop stock on Georges Bank has recovered dramatically from years of over-fishing, the population along the Maine coast is now so depleted that there is a moratorium on harvesting. As is true of many other marine animals, scallops broadcast their eggs and sperm into the sea. If populations are severely depleted the chances of sperm finding an egg to fertilize can be seriously diminished. Julien, Rick and colleagues in Maine and Massachusetts are trying to determine how distance between spawning scallops affects reproductive success, and in turn whether those in depleted areas are too far apart to successfully reproduce.



Julien Gaudette in the flowing seawater laboratory with scallops.

This summer's laboratory experiments were designed to understand the factors that influence fertilization success, such as gamete dilution, time since spawning, and temperature. These experiments will set the stage for next summer's field experiments.

Assisting Gaudette and Wahle were UMaine graduate student, Mahima Jaini and summer intern, Katherine Thompson. Also collaborating on the project are Dr. Mike Sieracki of Bigelow Laboratory, who is developing

flow cytometry techniques to automate gamete counting and sorting. Dr. Kevin Stokesbury of UMass Dartmouth is providing actual data on population densities and spatial dispersion patterns of adult scallops on offshore grounds to identify areas at risk of low reproductive output.

The project is funded by the National Marine Fisheries Service Scallop Research Set-aside Program.



Dr. Will Jaeckle

Gulp!

Dr. William Jaeckle's research is all about "underage drinking" - how larval invertebrates process water through their digestive system to obtain nutrients from the environment. Will is an invertebrate physiologist and faculty member at Illinois Wesleyan University and colleague of Dr. Kevin Eckelbarger. While his interests include all invertebrates, his work at the DMC during the spring of 2009 was with larval bivalves and polychaetes. Will's previous research has shown that some invertebrate larvae can absorb dissolved organic material (DOM) through their external surfaces. His current research explores the possibility of the larvae doing the same through their internal surfaces. The results of his work are apt to illustrate the remarkably unique and efficient feeding mechanisms that exist across the invertebrate realm.

VISITING INVESTIGATORS

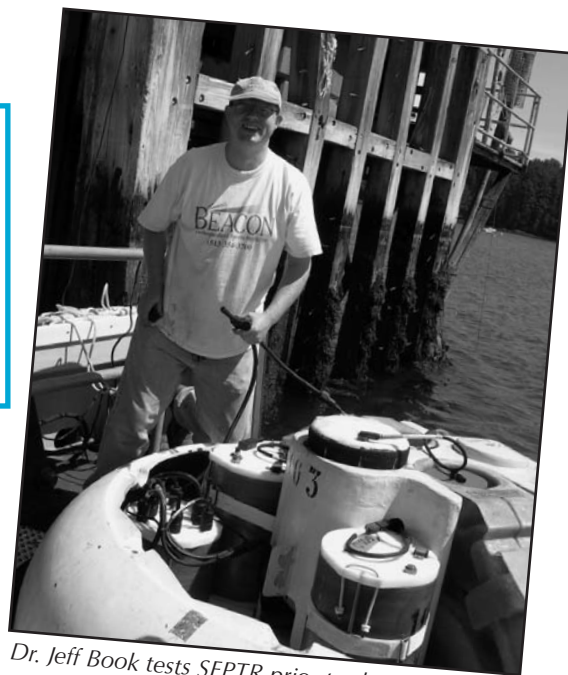
The DMC is a user-friendly field station for marine researchers. Competitive rates and easy access to diverse intertidal and subtidal habitats of the Gulf of Maine have drawn hundreds of scientists to the DMC in the last decade. Our professional support staff can provide assistance with specimen collection, equipment use, laboratory set up and housing. For more information, contact Tim Miller, Laboratory Manager, at temiller@maine.edu.

Microbial Energy from Anoxic Sediments

Dr. Jeff Book, an oceanographer at the Naval Research Laboratory (NRL), Stennis Space Center, MS, is expanding the power producing capability of microbial fuel cells. If successful, large-scale microbial batteries could be used to continuously power underwater environmental monitoring units capable of measuring the physical and optical properties of seawater as well as tidal/current flow.



Andrew Quaid and the fuel cells.



Dr. Jeff Book tests SEPTR prior to deployment.

Microbial fuel cells tap sulfur-reducing microbes like *Geobacter* that live in anoxic marine sediments. The fuel cell converts chemical energy resulting from redox-reactions to electrical energy. This summer Jeff's fuel cells were embedded in anoxic sediments adjacent to the DMC pier and a monitoring device called SEPTR (Shallow-water Environmental Profiler in Trawl-safe Real-time configuration) was deployed nearby. Preliminary results suggest that the batteries were indeed capable of producing the power necessary to run the SEPTR and set the stage for further development.

The Damariscotta River Estuary was chosen as the first test site for a number of reasons: the high tidal regime of the estuary, personnel connection with Dr. Hank Perkins (former NRL oceanographer/current UMaine Research Professor in the School of Marine Sciences), and the excellent support available from DMC staff and through DMC facilities.

Also involved in the research project is Andrew Quaid, who was on site with Jeff for battery deployment and has a dual role as a NRL ocean technician and a graduate student at the University of Southern Mississippi; Dr. Yoko Furukawa, NRL geochemist at Stennis Space Center; and Dr. Leonard Tender, NRL biochemist in Washington, D.C.

Underwater Opportunities for Students

For students interested in marine biology and ecology, being SCUBA certified as a scientific diver can open doors to internships, graduate studies and professional careers worldwide. To help students reach these goals, the UMaine School of Marine Sciences offers a semester-long scientific diver training program. Introduction to Research Diving (SMS-491) is a three credit course offered annually during the fall semester at the DMC. The course includes more than 12 open water dives and meets the minimum requirements for academic and practical training of scientific divers as established by the American Academy of Underwater Sciences (AAUS).

Students who successfully complete all course objectives are prepared to use diving to pursue their educational or research goals at numerous AAUS institutions worldwide. Other unique opportunities for AAUS qualified divers include scholarships and internships provided by both AAUS (www.aaus.org) and the Our World-Underwater Scholarship Society (www.owuscholarship.org). Previous recipients of AAUS scholarships include UMaine's own Susie Arnold (2007).



JENN'S ADVICE TO UNDERGRADS:

Semester by the Sea at the DMC... it shouldn't be a consideration, it should be a given. The quality of education you receive at SBS is fantastic and the possibilities for learning are far greater than in a traditional classroom. The types of research conducted in SBS classes will give you a far better indication of whether you want to continue in a research career and what types of research you are interested in pursuing.

SBS INFO ON THE BACK PAGE!

Dr. Jenn Page

SBS '01, B.S. UMaine '03
Ph.D. Georgia Tech '09



Dr. Sara Lindsay (left) and Dr. Jenn Page (right)

Introducing Dr. Jennifer Page

Jennifer Page, nee Jackson, was only a high school student when she first visited the DMC campus. At the time, she held a MERITS internship with Dr. Sara Lindsay. In the ensuing years, she enrolled in UMaine, became a marine science major, continued working in Sara's lab and participated in the Semester by the Sea Program (SBS info on page 12). Jenn has completed her Ph.D. and we're happy to have her back at UMaine as a postdoctoral fellow.

Jenn completed her Ph.D. at Georgia Institute of Technology in 2009. There she held a NSF IGERT fellowship for Aquatic Chemical Signaling and worked in the lab of Dr. Marc Weissburg. Jenn's dissertation focused on the foraging behavior of blue crabs as a model to understand what happens to a chemical signal from the point when it is released from a particular prey source, how it is affected by environmental forces (e.g., turbulence) as it is transported through the environment, the aspects of that signal that actually reach the chemosensors of a blue crab, and the behavior that results from those signals. Her thesis is currently the most comprehensive examination of odor signal input-behavioral output functions for animals in turbulent plumes.

During her grad school years Jenn continued to collaborate with Sara. Now, as a postdoc in Sara's lab, Jenn is studying the effects of repeated injury on the survival, activity, growth, and nutritional condition of a head down deposit feeding polychaete, *Clymenella torquata* (Maldanidae). Her work once again brings Jenn to the shores of the Damariscotta River and the laboratories of the DMC.

Addison E. Verrill Awards for Marine Biology



Catharine Hoffman



Elizabeth Robinson

Elizabeth Robinson and Catharine Hoffman were 2009 recipients of Addison E. Verrill Award for Marine Biology.

Elizabeth is a M.S. student at Texas A&M University, Corpus Christi working with Dr. Lee Smee and studying the foraging behavior of green crabs, *Carcinus maenas*, in response to chemical and visual cues under different flow regimes. Preliminary experiments conducted in Texas showed that increased velocity and turbulence disrupted the ability of green crabs to detect prey, dogwhelks and blue mussels. Her reason for coming to the DMC was to conduct similar tests in a flow-through flume using local specimens that have not been stressed by shipping and handling.

Catharine is a Ph.D. candidate at the University of Pennsylvania working with Dr. Peter Petraitis. Her project is large in scope and aims to prove her hypothesis that seaweed detritus provides an energy subsidy to some intertidal consumers which in turn leads to differences in community structure that vary with detritus input level.

Catharine's preliminary research showed a strong correlation between biomass of detritus, *Ascophyllum* and *Fucus*, and the shell size of periwinkle snails, *Littorina littorea*, on Swan's Island. Her goal for the summer was to test the hypothesis on a regional scale: the intertidal zone of the Gulf of Maine from Nahant, MA to the Schoodic Peninsula, ME. Additionally, controlled experiments in the flowing seawater lab were conducted to determine if snails actually prefer detrital seaweed over fresh.

VISITING GRADUATE STUDENT AWARDS

The DMC has been awarding facility grants to visiting graduate students for five years. The [Addison E. Verrill Award for Marine Biology](#) and the [Henry Bryant Bigelow Award for Oceanography](#) are bestowed to graduate students who need access to a marine laboratory to carry out their thesis research. Each award provides up to \$3400 annually for 1-4 years of facility use: housing, laboratory space, aquaria, SCUBA support and boat rentals. Eligible students must be currently enrolled in a recognized graduate program. Preference will be given to students who conduct field-oriented studies, but who have had limited marine lab or field station experience. Application deadline is February 15.

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The Periwinkle Zones

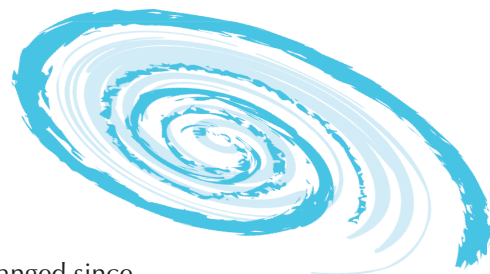
Francois Deniaud, a Master's student at Wageningen University in the Netherlands, spent two months at the DMC studying the ecology of two periwinkle species on the Maine coast with the help of Dr. Bob Steneck.

Littorina saxitalis is a native periwinkle and is most common in the upper intertidal zone of rocky shore. *Littorina littorea* is an introduced species from Europe that arrived on our shores over 150 years ago. It resides in the mid- and lower intertidal zones. In an effort to understand why these two similar species live in different zones and how *L. saxitalis*'s habit may have changed since the introduction of *L. littorina*, Francois examined desiccation tolerance, grazing habits and food availability.



Francois Deniaud

These studies eventually shed light on ecological questions that Francois subsequently explored. It appears that predation pressure by the green crab, *Carcinus maenas*, plays a strong role. The green crab's strong preference for *L. saxitalis* over *L. littorea* leads Francois to believe that predation is the primary mechanism defining the special distribution of the two species. Interestingly, the green crab is also an introduced species arriving on New England shores about the same time as *L. littorea*.





Cnidarian Tree of Life researchers aboard the R/V Ira C.

The Cnidarian Tree of Life Meeting

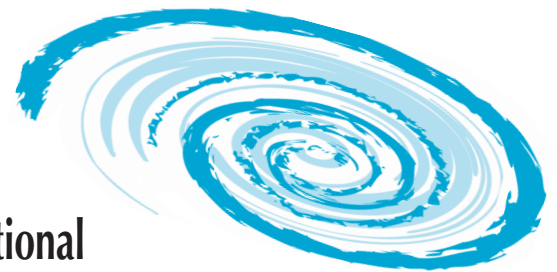
Scientists involved in the Cnidarian Tree of Life (CnidToL) program gathered at the DMC in early August for their 4th annual meeting. The CnidToL group is interested in the phylogeny of the phylum that includes jellyfish and corals. The 5-day meeting organized by Dr. Paulyn Cartwright, University of Kansas, focused on current developments in the evolutionary history of cnidarians and provided ample opportunity for sampling trips, choreographed by Dr. Meg Daly, Ohio State University. Scientists branched out in all directions, cruising the estuary and coastal waters aboard the R/V *Ira C.* and scouring midcoast Maine's intertidal habitats with boots and buckets to collect representative samples of all the cnidarians in our local fauna.

The meeting also provided an opportunity for collaboration between CnidToL researchers and DMC personnel. Dr. Scott France and graduate students Jana Thoma and Eric Plante, Louisiana State University, came a week early to work with Dr. Les Watling and graduate student Anne Simpson. All study a group of cnidarians called octocorals. During the week a series of deep sea octocoral taxonomic problems were sorted out, and important progress made toward reconciling molecular genetic information with morphological details for two of the most common deep-sea families, the chrysogorgiids and the bamboo corals.

OVER THE LAST 5 YEARS

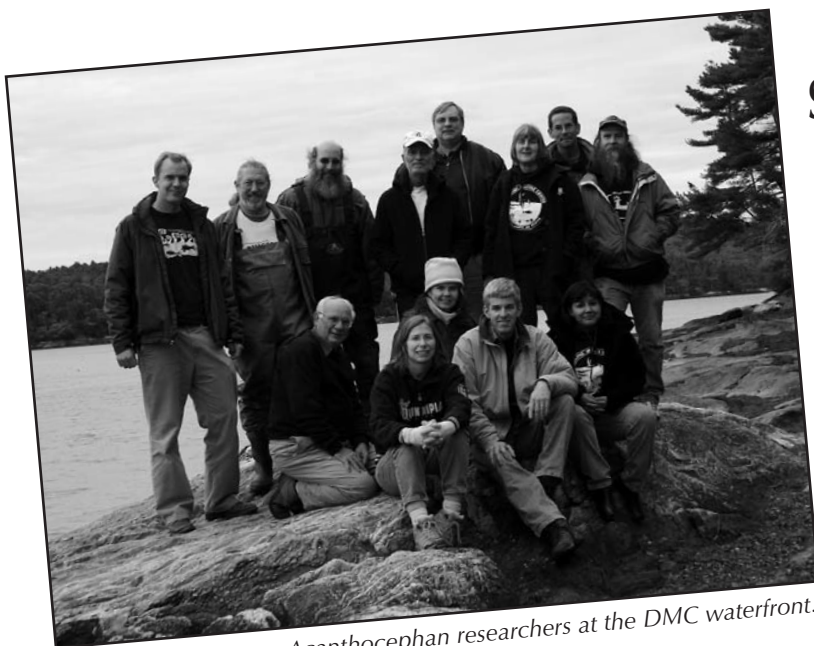
4964 people have attended a scientific meeting, conference, professional development workshop or teacher training at the DMC.

The Darling Marine Center is the perfect venue for your next scientific conference, educational workshop, or staff retreat. We have comfortable meeting space as well as flowing seawater classrooms and laboratories suitable for hands-on workshops. In the immediate vicinity we have a wide variety of marine ecosystems, everything from calm mudflats to exposed rocky headlands. To top it off, we offer a variety of housing options, great food and beautiful scenery. For more information contact our Conference Coordinator at 207-563-3146, ext. 200 or by e-mail at lhealy@maine.edu.



Seventh International Acanthocephalan Workshop

There are only about 30 people worldwide that specialize in the biology of thorny headed worms and every four years they gather to discuss current trends in acanthocephalan research, establish new relationships and develop future collaborations. The Seventh International Acanthocephalan Workshop was held at the DMC and was attended by acanthocephalan aficionados from Australia, Mexico, and the United States. It included oral presentations, lively plenary discussions, and field trips to sample local fauna in search of these parasitic invertebrates. Dr. Dennis Richardson, Quinnipiac University hosted the event.



Acanthocephalan researchers at the DMC waterfront.



Above & right: Middle school teachers from across Maine gathered at the DMC for an IDEAS retreat.

IDEAS

Inquiry-based Dynamic Earth Applications of Supercomputing: Seeing the Big Picture with Information Technology

The IDEAS project connects UMaine researchers with students and middle school teachers to utilize computer modeling and visualization of geological processes in the classroom. Over the course of three years, 60 teachers and 180 students will complete the program.

This summer the second cohort of Maine middle school teachers participating in IDEAS met at the DMC for a 5-day technology retreat. Program leaders Dr. Bruce Segee and Dr. Yifeng Zhu, Electrical and Computer Engineering, and Dr. Peter Koons, Earth Sciences and Climate Change Institute, showed teachers how to network laptop computers, create high resolution interactive visualization displays and run NetLogo, a programmable modeling environment for simulating natural and social phenomena. A seminar on Google Apps presented by Google professionals was also part of the retreat.

IDEAS is funded by the National Science Foundation's Innovative Technology Experiences for Students and Teachers (ITEST) program. ITEST aims to engage K-12 students in science, technology, engineering and mathematics via the cyberinfrastructure.

[HTTP://ARCH.EECE.MAINE.EDU/IDEAS](http://ARCH.EECE.MAINE.EDU/IDEAS)



Above: Margaret Merrill addresses participants in the COSEE K-5 teachers training.

Concept Mapping Explored in K-5 Teacher Training

A concept map is a diagram showing relationships between concepts or ideas. The Centers for Ocean Science Education Excellence-Ocean System (COSEE-OS) uses the process of concept mapping to illustrate the big picture — how basic physical science concepts like temperature, density and buoyancy, apply to various scientific


disciplines, specifically in the realm of ocean science and climate change. COSEE-OS has been teaching concept mapping to educators and scientists since 2005. It is an exercise that teachers find useful for organizing their syllabi and for accessing how well students are processing the coursework. Scientists also find the technique helpful in organizing their thoughts and presenting them to others.

In an effort to improve ocean literacy at the elementary school level, Margaret Merrill, College of Education and Human Development, designed an educator-scientist collaborative workshop as part of her doctoral research. With a focus on phytoplankton, the pilot workshop introduced teachers of kindergarten through grade 5 to concept mapping and COSEE-OS signature web-based interactive teaching tools including "Concept Map Builder". The workshop also provided a venue for teachers to meet with research scientist, Dr. Sonja Dyhrman from Woods Hole Oceanographic and Dave Guay from University of New England.

Annette deCharon, Director of COSEE-OS stated: "While designing workshops and the tools to support them, we have always looked to scientists, middle school and high school educators for feedback. Results from this workshop have given us a glimpse into the scope of work it would take to really meet the needs of elementary educators. In the coming months – as we take on the challenge of writing a proposal to continue funding for five more years – this type of information will help inform the future of COSEE-OS."

COSEE-OS is funded by the National Science Foundation.

[HTTP://COSEE.UMaine.EDU](http://COSEE.UMaine.EDU)

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10-week journey students sail the ship over 3,000 nautical miles and take courses in marine science, celestial navigation, nautical science and maritime history/literature. The SEAmester program is newly accredited by UMaine for 12 undergraduate credits and is open to students from all undergraduate institutions.

Application materials available at www.seamester.net



Semester by the Sea

Semester By the Sea (SBS) is for undergraduate science majors keenly interested in the marine realm. SBS students live at the DMC during the fall semester and explore the organisms, habitats and maritime history of the Gulf of Maine. Motivated upperclassmen considering graduate school or professional careers in marine science and oceanography will find SBS invaluable. The program is open to students from UMaine and outside institutions. Field-oriented courses include:

- Marine Ecology
- Design of Marine Organisms
- Biology of Marine Invertebrates
- Zooplankton & Ichthyoplankton
- Maritime History & Archaeology
- Introduction to Research Diving
- Human Impacts on the Ocean
- SBS Undergraduate Seminar



Read what the students are saying about SBS:

www.umaine.edu/marine/programs/sbs1.php

Detailed program description and application form at www.dmc.maine.edu/sbs.html