

Intertidal Tidings

Newsletter for the UW Friday Harbor Laboratories • Autumn 2010 • Volume 18

The material world of climate change: an oceanic shell game

The survival of many of our favorite coastal organisms is constrained by the integrity of their structural components. Is their shell strong enough to deter predators? Is their attachment to rock secure in the face of strong waves and currents? What will happen to coastal marine communities as changing environmental conditions, such as ocean acidification or warming, alter the way key biomaterials are manufactured and maintained? These are the questions guiding a team of marine biomaterials experts at Friday Harbor Laboratories over the next three years. Funded by the Emerging Frontiers CRI-OA Program at the National Science Foundation, the \$0.9 M project is led by Emily Carrington (PI, FHL) in collaboration with Adam Summers (co-PI, FHL), Michael O'Donnell (FHL) and Patrick Martone (University of British Columbia).

The impetus for the research comes from recent insights by Emily Carrington (Professor, Dept. of Biology, UW) and colleagues into the seasonal dynamics of wave-swept mussel populations; their ability to manufacture strong tethers can be compromised dramatically by various environmental and physiological demands, to the point where mussels can be washed away readily by even modest storms. Clearly, the structural integrity of a mussel is constrained by environmental conditions; the new project applies this *ecomaterials* perspective to the emerging problem of ocean acidification. The research will target a suite of organisms (including mussels, snails, crabs, and calcified red algae), each with one or more well-known biomaterials that serve a critical ecological function.

The project capitalizes on the recent development of two new major research facilities at FHL. The first is the ocean acidification (OA) mesocosm and analytical laboratory facility in Lab 7, which allows the exposure of organisms to precise combinations of CO₂, temperature and food supply for several months (NSF FSML, see Fall 2009 Int. Tidings). The second is iCOMBE, or the integrated Center for Marine Biomaterials and Ecomechanics, which is based in Lab 9 and houses a unique suite of instruments for the

visualization and characterization of biological materials from nano to macro scales. Under the direction of Summers and Carrington, iCOMBE will also include a new building with several research flumes, which should be completed by summer 2011. (NSF FSML grant, see page 4.) These state-of-the-art tools will perform standard engineering analyses that detail how various environmental conditions affect the structural integrity of both calcified and non-calcified materials.

Of course, the real acid test is to ask how changes in material properties scale up to affect the performance of an organism under real-world challenges. Organisms reared in the OA facility will also be subjected to ecologically relevant assays, evaluating the performance of materials in the face of crashing waves, rasping snails, or crushing crab claws. The ultimate goal of this integrative, comparative research is to provide insight into the range of possible biological responses to future changes in ocean climate.

The project provides numerous training opportunities for students, a hallmark of FHL research. For example, undergraduates can conduct their own research projects as part of the autumn MBQ Apprenticeship or summer REU-Blinks programs. The grant also provides full support for graduate students in the summer Biomechanics course, next offered in 2012 by Carrington, O'Donnell and Martone.



Apprenticeship or summer REU-Blinks programs. The grant also provides full support for graduate students in the summer Biomechanics course, next offered in 2012 by Carrington, O'Donnell and Martone.

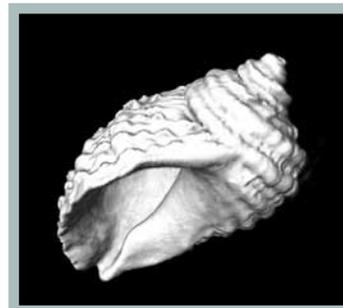


Photo: Emily Carrington deploying temperature sensors at intertidal field site.

Photo by Michael O'Donnell

left: 3-D rendering of a *Nucella ostrina* shell, by Thomas Kleinteich

We thank the many donors who so generously helped us meet the challenge to match our NSF FSML funding for the new FHL Ocean Acidification Lab. Your support has been critical to the success of this project!

FHL Research Apprenticeship Program

An Endowment, a Challenge, a Fantastic Opportunity

In fall 2009, Henry and Holly Wendt indicated their intention to start an endowment for the FHL Research Apprenticeship Program. Their generous gifts will total \$700,000 but the final endowment could be much larger, because Henry and Holly have issued a challenge to our FHL Advancement Board to match their gift, at which point they will increase the endowment by another \$300,000. If we are successful in finding funds to match their gifts, the final endowment could be as high as \$1.7 million dollars.

Raising the matching funds is critically important. Some splendidly qualified students with limited financial resources cannot attend FHL programs because of economic recession-caused UW tuition fee increases and drop in donations to student support programs. If you are an alum of FHL, you can appreciate the impact of such a lost opportunity on a student's career development. We don't want to have to say no to students who should be part of the next generation of stellar marine researchers.

This is a fantastic opportunity to make the apprenticeship program a permanent part of the FHL experience, as it begins its second decade.

Can you help us? Donations can be sent to FHL or made online at <https://www.washington.edu/giving/make-a-gift>. If you have suggestions of new people, foundations, or corporations that might be interested in contributing to this match, please contact Rachel Anderson (360-278-2165, ext. 2) or Ken Sebens (360-378-2165 ext. 5). Your suggestions will be kept confidential.

A Close Look at a Research Apprenticeship

by Jan Newton

I am an oceanographer on the UW Seattle campus, but for the past seven autumn terms it has been my pleasure to come to the Friday Harbor Labs to lead a Research Apprenticeship. FHL Apprenticeships are different from regular university courses in that undergraduate and post-baccalaureate students are taken out of the classroom and immersed in real scientific research. Placed in an environment that provides support but also time for truly independent work, apprentices grow and achieve in ways they may never have expected.

My apprenticeship is titled Pelagic Ecosystem Function in the San Juan Archipelago, and I co-lead it with Breck Tyler, an ecologist from UC Santa Cruz. Our research focuses on the open water environment and organisms of San Juan Channel.

This is a complex ecosystem where inputs from oceanic realms and major river systems are mixed by a powerful tidal regime to create habitat for a diverse community of prey and predator species. In this "natural laboratory" our apprentices explore the pelagic ecosystem from bottom to top, studying the water properties that shape the habitat and the inhabitants themselves, from diatoms to sand lance to sea lions.

The success of our program is in large part due to the unique capabilities of Friday Harbor Labs. Here we are in close proximity to various deepwater environments we access via the FHL research vessel Centennial. FHL provides laboratory and computer facilities but also a special ambiance, a place for apprentices to share daily life, ideas, and aspirations with professional scientists.



Photo by Jan Newton

This apprenticeship is a great learning opportunity but it also produces quality research. Each year, our apprentices make new discoveries about, for example, how local oceanographic conditions transition during fall or how strong tides control the distribution of food-web components. But more importantly we have been able to gather environmental data across a number of years – since 2004 and counting! Comparisons of physical properties and biotic communities among years, during El Niño and La Niña years for example, sharpen our ability to identify patterns of variation and the underlying factors. We believe this may well help us understand future changes in the pelagic ecosystem stemming from climate change.

We also believe it is important to share this amazing research opportunity, so we have cultivated strong outreach ties. On shared cruises, our apprentices interact with students from the Northwest Indian College, passing along first-hand the research techniques they have recently learned. We also join a UW undergraduate Oceanography class (Ocean 260) for a Puget Sound cruise, mentoring those beginning students on sampling and analysis procedures. In both cases, the peer-to-peer knowledge transfer is an effective learning experience for all involved.

I opened this article by saying it was my "pleasure" to lead this apprenticeship. This is genuinely my feeling and absolutely my experience. I feel truly fortunate to be in a position to guide the inquiry of a team of dedicated apprentices, to help them develop research skills, and most importantly to watch each one gain the confidence to know he or she can be part of the next generation of independent scientists.

FHL Student Support

Adopt-a-Student

by Adam Summers

There is no more important program at the Labs than the summer courses. They have inspired hundreds of students to do great things. They serve as a cutting edge forum for the latest science as well as grounding in important natural history vital to a marine biologist. Each year we have more students who apply than attend the courses for a myriad of perfectly understandable reasons. This past summer, we saw the coming together of a number of factors that led, for the first time, to more students declining to attend for financial reasons. With UW tuition up 30% and the labs compelled to raise housing and food rates, a summer course costs more than ever. The financial downturn has left us with half the endowment output and declining contributions from our supporters. If ever there was a time to step up and adopt a student, this is the year. We need these funds to make the summer courses affordable for all. We are working on a number of plans that will reduce the cost of summer courses in the longer term (including the Marine Life Endowment) but in the meantime we need to get through this difficult time without abandoning students who cannot afford our courses. Donations to the FHL Adopt-a-Student program preserve our international flavor, the diversity of the student body and the reality that the summer instructors get to teach the very best students in the world.



Kevin Schofield, shown above with daughter, Xanda (left), and adopted student Tiffany Yap (right).

“It was great to meet Tiffany and hear about her experiences at FHL and what she plans for her future. She is a true inspiration and I’m so glad I could help to support her through the Adopt-a-Student program.”

Do you have spare miles?

We are looking for travel support for our students!

If you have extra airline miles that you would be willing to use to purchase a reward ticket for a student attending a course at FHL, please contact

Rachel Anderson at rachelea@uw.edu
360-378-2165, ext. 2.

My summer of love

by Noa Shenkar

I always refer to my first summer at Friday Harbor Laboratories (2003) as my own “summer of love.” Not because I had some great romance there, but because I fell deeply in love with the place and its unique atmosphere.

When I first heard about Friday Harbor Laboratories, I was a M.Sc. student at Tel-Aviv University, studying coral bleaching. I already knew that I wanted to pursue an academic career and teach at the university, and I had just begun to realize that in a small place like Israel, I would really need to be someone special in order to reach this goal. I thought it would be a good idea for me to step outside my comfort zone and that is how I ended up in the Marine Invertebrate Zoology class of 2003. I was fortunate to receive financial support from Friday Harbor Labs and from Tel-Aviv University for this purpose.

The course completely changed my career path. During the course, I realized that there is rich life outside the coral reefs. Instead of studying corals, I decided to move toward the end of the textbook and convert to ascidians. I met Gretchen and Charlie Lambert and Prof. Billie Swalla and was deeply impressed by their genuine love of and interest in these creatures. They motivated me to approach my PhD committee and suggested the need to study ascidian ecology along the coasts of Israel. I was greatly impressed by the number of female researchers I met in Friday Harbor. I returned to Israel in a euphoric mood knowing that I’d found the marine biologists’ paradise. I made up my mind that that was only my first visit and that others would follow.

Seven years later, I am a post-doc at Prof. Billie Swalla’s lab studying ascidian phylogeny. I am also personally trained by Gretchen Lambert in ascidian taxonomy. We recently discovered a new *Boltenia* species from the Red Sea which I named after my PhD advisor, *Boltenia yossiloya*. Unfortunately, it is not as pretty as the heart-shaped *Boltenia villosa* from Friday Harbor. I am the only researcher studying ascidians in the Red Sea and Eastern Mediterranean. If I hadn’t received the opportunity and support to come to Friday Harbor in 2003, I may have been only another coral reef biologist.

I just finished co-teaching the Marine Invertebrate Zoology class of 2010. (Mar Wonham was my co-instructor.) We had terrific students that were very dedicated to the course. For five weeks they went night-lighting every evening, bringing fascinating organisms to the lab. Luckily, no one fell off the dock...

I hope my students will also refer to this summer as their own “summer of love.”



Laura Long and her adopted student Lisa Fong.

Photos by Rachel Anderson

Grant Supported Research

NEW Grants to FHL

Integrative Biology and Ecology of Marine Organisms. NSF. Division of Biological Infrastructure and Ocean Sciences. PI: Adam Summers, Co-PI: Emily Carrington, 2010-2013.

This grant establishes FHL as a NSF REU site. It will support 10 students per year for three years. It is vitally important that visiting researchers step up to mentor these students and allow us to maintain a high quality experience for what has been a very diverse group of students. The research experience is designed to increase ocean literacy and familiarity with the marine environment within the framework of an all encompassing scientific community that will offer a full career's worth of support and guidance. Our variety of pristine and impacted intertidal and subtidal habitats will serve as the platform for student projects. Participants recruited from a national pool of undergraduates will take advantage of this coastal environment and the diversity of research approaches at the Labs to engage in truly interdisciplinary work. The program includes research mentoring and also formal training in the tools needed to become a biologist, including ethics and the responsible conduct of research, science writing, presentation, and outreach. Students are expected to engage in one-on-one research at the labs for the entire 8-10 week program, during which they will also participate in exercises designed to further their development. This program will build on the success of the FHL Blinks Fellowship program by offering more students an opportunity to participate. The educational, career development and team building aspects of the program will be tracked to show the lasting effects on student participants.

A multipurpose seawater flume. NSF. Division of Biological Infrastructure. PI: Adam Summers, Co-PI: Emily Carrington, 2010-2012.

We have been awarded a grant to acquire a seawater flume with a force balance. This flume will complement the research productivity of the existing racetrack flume and will draw new researchers to the labs. The automated multi-axis force balance will also leverage the excellent model building facilities at the labs. The instrumentation with this flume has not been used in comparative biomechanics research to date and will provide the most complete and biologically relevant force measurements for attached organisms. We expect graduate education at FHL will be enhanced through the use of the flume in the Biomechanics, Functional Morphology of Fishes, and Sensory Neurobiology and other courses.

We are in the process of specifying the parameters for the new flume as well as upgrades for the racetrack flume. We encourage interested researchers to get in touch with us about the capabilities they feel are important.

Effects of ocean acidification on coastal organisms: an ecomaterials perspective. NSF. PI: Emily Carrington Co-PI: Adam Summers with Michael O'Donnell and Patrick Martone, 2010-2012. (For more details see cover article.)

The role of disease in San Juan Archipelago eelgrass (*Zostera marina*) decline: An untested but potentially serious problem. WWW Foundation. PI: Sandy Wyllie-Echeverria, Co-PIs: Joe Gaydos, Anne Boettcher and Daniel Martin, 2010-2011.

This grant supports a project to investigate in detail two geographically adjacent sites with varying *Z. marina* genetic diversity and population stability, followed by four additional sites sampled less intensively, providing much-needed information on the diversity and distribution of this opportunistic pathogen. We will transfer results of our investigation and a program designed to determine sites at risk from a disease outbreak to federal, state and county agencies responsible for natural resource management.

Background: In 2003 and 2004, relatively rapid decline of *Zostera marina* meadows was observed at several sites in the San Juan Archipelago, a prominent feature of the Salish Sea sub-region of the Pacific Northwest. Cause for these declines is still the subject of investigation, however, even though the pathogen known to bring about a disease epidemic exists in the San Juan Archipelago, the possibility that acute loss was the result of a disease event has not been thoroughly tested. Microorganisms of the genus *Labyrinthula* are the most notable disease agents.

Collaborative Research Proposal. Motor Driven Pattern Formation during Cell Division. NSF. PI: Linda Wordeman, Co-PI: Garrett Odell, 2010-2013.

During cell division, the cytoskeleton reorganizes itself rapidly to align and separate chromosomes, and then cleave the cell in two. A long-standing hypothesis proposes that molecular motors carry signals along microtubules of the mitotic apparatus to tell the cell surface where to contract. This project will directly test this hypothesis by investigating the quantitative conditions under which motors of the kinesin family can translate the information immanent within the rapidly-changing microtubule array into a pattern of Rho signaling at the cell surface. Investigators will create hybrids between motor proteins and photoactivatable fluorescent proteins and measure their biochemical properties. They will measure motor motility parameters by observing single motors attaching to and moving along single microtubules in vitro. These same hybrid motor probes will be introduced into cells, and live imaging will be used to measure their dynamic behavior during cell division at high resolution. Advanced 3D computer simulations will be developed to predict how these same quantified agents behave in the context of the whole cell. By combining live-cell imaging, single-molecule measurement, and computer simulation of hypothetical outcomes, the project will produce an account of the physically-plausible conditions under which the cell's toolkit of molecular motors and cytoskeletal assembly regulators could add up to a mechanism for robust spatial pattern formation during cell division.

Ongoing Grants Awarded to Faculty at FHL

The following list illustrates the broad range of externally funded research being carried out by UW faculty working at FHL. This is only a partial list of FHL research, since there are many visiting researchers funded by grants through their own universities.

Alberts, J., PI., NSF. Molecular mechanics to dynamics of cell shape change and tissue morphogenesis, 2008-2011.

Andersen, R., PI., NSF. Evolutionary relationships among heterokont algae, 2009-2011.

Carrington, E., PI., NSF. Effects of temperature on ecological processes in a rocky intertidal community. 2008-2012.

Dethier, M., PI., Sea Grant. Physical and biological impacts of shoreline armoring. 2010-2012. (Collaboration with UW SAFS, School of Oceanography, and Washington Dept. of Natural Resources)

Dethier, M., PI., King County. Intertidal biota surveys at Point Wells. 2006-2010.

Duggins, D., PI.; Co-PIs: Kevin Britton-Simmons, Kenneth Sebens, Charles Simenstad and James Eckman, NSF. Spatial subsidy and trophic connectivity between nearshore macrophyte production and subtidal food webs. 2009-2012.

Greene, H.G., PI., National Parks Service. Benthic Mapping. 2010-2011

Greene, H.G., PI.; Co-PI: Tina Wyllie-Echeverria, Dept. of Ecology. Pacific Sand Lance. 2010-2011.

Hanson, B., Sebens, K., PIs., NOAA. Marine mammal research: R/V Centennial. 2008-2010.

Newton, J., Sebens, K., PIs., Washington Department of Ecology. Joint effort to monitor the Straits. 2007-2010.

Odell, G., PI., NIH-NIGMS. Gene networks: molecules to mechanistic models. 2008-2010.

Sebens, K., PI., NSF. Effects of marine preserves and nonindigenous species on rocky subtidal communities: indirect interactions, disturbance and community dynamics. 2009-2013.

Sebens, K. PI., NSF OACIS. GK-12: UW Graduate students with K-12 Teachers. Ocean and Coastal Interdisciplinary Science. 2008-2013.

Summers, A. PI., NSF. Tesselated Skeleton. 2009-2011.

Swalla, B., Halanych, K., PIs., NSF. Systematics and evolution of hemichordates. 2008-2011.

Wyllie-Echeverria, S., Ward, P., PIs., NSF. H₂S poisoning and community structure in the lower intertidal, shallow subtidal region in small embayments of the Pacific Northwest. 2009-2011.

Wyllie-Echeverria, S., PI., Puget Sound Partnership. Education on WA State Ferries. 2010.

Wyllie-Echeverria, S. PI., Washington State Department of Natural Resources and Washington Sea Grant. *Zostera japonica* Workshop. 2010-2011.

Wyllie-Echeverria, S. PI., National Park Service. Water quality assessment of Garrison Bay (English Camp) and Griffin Bay American Camp. 2010-2011.

2011 FHL COURSES

Spring Quarter (March 28 - June 3)

- I. **The ZOO-BOT Quarter:**
Three Integrated Courses
 - Marine Zoology (Biol 430)
 - Marine Botany (Biol 445)
 - Research Apprenticeship:
 - Intertidal Ecology and Physiology
- II. **Beam Reach Program**
(Ocean 360 + Ocean 365)
- III. **Three Seas Program**
(Northeastern University)
March 28 - May 20

Summer Term A (June 20 - July 22)

- I. **Marine Invertebrate Zoology**
(Biol 432)
 - II. **Ocean Acidification** (Biol 533)
 - III. **Comparative Invertebrate Embryology** (Biol 536)
 - IV. **Marine Bioacoustics** (Fish 507)
- Blinks-NSF REU Research Fellowship**
(8-12 weeks)

Summer Term B (July 25 - Aug. 26)

- I. **Evolution & Development of the Metazoans** (Biol 533)
 - II. **Fish Swimming** (Fish 565)
 - III. **Marine Birds & Mammals***
 - IV. **Marine Algae** (Biol 539)
- Scientific Diving** (non-credit short course, dates to be determined)

Autumn Quarter (Sept. 28 - Dec. 9)

- I. **Marine Biology Quarter**
(3 of the following 6 courses)
 - Marine Biology (Biol/Ocean/Fish 250)
 - Social Change and the Marine Environment (Envir 450/Soc 401)
 - Farming, Fish and Local Food*
 - Ichthyology (Biol/Fish 311)
 - Ocean Circulation (Ocean 210)
 - Marine Environment Research Apprenticeship*
- II. **Research Apprenticeship: Pelagic Ecosystem Function in the San Juan Archipelago** (Ocean 492)
- III. **Research Apprenticeship: Spatial Ecology of the Salish Sea Benthos** (Biol 479)
- IV. **Beam Reach Program**
(Ocean 360 + Ocean 365)

* Please visit our website for additional course numbers and online application.
<http://depts.washington.edu/fhl>

Marine Field Equipment Endowment

We are pleased to share the news that Gordon and Helen Robilliard, with their generous contribution, have launched the FHL Marine Field Equipment Endowment. As many of you know, there's no better way to pursue compelling topics of marine research than to come face to face with them in marine waters.

This new endowment will be used to support and maintain FHL marine field equipment, including, but not limited to vessel maintenance and replacement. To learn more about how you can contribute to the Marine Field Equipment Endowment, please contact Cara Mathison, caram@uw.edu or Rachel Anderson, rachelea@uw.edu.

Save the Dates

May 14

FHL Annual Open House

June 4

Jazz at the Labs
(FHL SOP Fundraiser)

The Helen Riaboff Whiteley Center

10th Anniversary Celebration

by Ken Sebens

On May 2, 2010, Friday Harbor Labs celebrated the 10th anniversary of the Helen Riaboff Whiteley Center, a retreat for scholars and artists from diverse disciplines created by Arthur Whiteley in memory and honor of his wife, Helen Riaboff Whiteley. Well over 100 people gathered to celebrate this special occasion. As part of this celebration, Fu-Shiang Chia, Dennis Willows, Vera Stasuk and I congratulated Arthur for his creativity and hard work in conceiving, constructing and maintaining the Center over the last decade. I want to again give Arthur my thanks and congratulations for enriching the FHL campus with the addition of the Whiteley Center. Over the past five years, since I became Director of FHL, I have watched a steady stream of amazing people come here to work at the Center. I cannot express how much richer FHL has become because of this unique facility.

With the addition of the Whiteley Center, FHL has something to offer every scholar on campus, in every field, and they are making good use of it. Marine laboratories, often far from campus and specialized in a mission, are at risk in times of financial hardship for their universities. Having a Center that can be used by any and all faculty, and where they can interact with a diverse group of faculty from anywhere in the nation and the world, makes FHL even more valuable. While FHL has plenty of successes and achievements to point to, it now has many more through the Center that Arthur envisioned and created.



Arthur Whiteley surrounded by friends.

Photo by Kathleen Ballard

“**The delight for me about the Center is the incredible diversity of scholarship displayed by the 2000 plus users in the first 10 years. Books, papers, planning sessions and symposia – creativity without boundaries.**”

Arthur Whiteley

2010 Scholars

The Helen Riaboff Whiteley Center at Friday Harbor Labs provides a quiet retreat for scholars of all fields so they may reflect, study, write and create in a beautiful setting.

Over one hundred Whiteley Scholars were hosted in 2010. Some examples of the broad topics of their work include:

Chris Amemiya, Virginia Mason Research Center. Investigations of genome dynamism.

Elizabeth Austen, Work on full-length collection of poems titled, “How the End Begins.”

Gregory Butler, University of British Columbia. Manuscript preparations for a book on Bach’s concertos.

David M. Checkley, Jr., Scripps Institution of Oceanography. Written analysis of observations of optical plankton counters of zooplankton and other particles.

Dan Duling, Revisions of play, “Monstrosity,” (written during previous stay at the Whiteley Center). Also, revisions of a collection of five plays.

Pauline Erera, University of Washington. Investigations and analysis of Mexican-American parents’ experiences with the Child Welfare Services.

Gordon Fain, University of California, Los Angeles. Writing a second volume on a book on Latin Epigrams and a paper about the mechanism of light adaptation in vertebrate rods.

Mott Greene, University of Puget Sound. Continued work on an article entitled “Origin of Oceans.”

Charles H. Greene, Cornell University. Further study of the remote forcing of climate on NW Atlantic shelf ecosystems.

Michael Hart, Simon Fraser University. Investigations of genes that encode gamete recognition proteins in sperm and eggs of some sea star species.

Mimi Koehl, UC, Berkeley. Analysis of the morphogenesis of kelp blades of different shapes, using the giant bull kelp, *Nereocystis luetkeana*, as the research system.

Joel Kingsolver, Univ. of North Carolina, Chapel Hill. Research on how phenotypic plasticity affects the ecological and evolutionary responses of populations to directional climate change.

Jeffrey Levinton, SUNY Stony Brook. Writings about the geographic overlap of dispersed species, as well as updates to the book “Marine Biology: Function, Biodiversity, Ecology.”

Mark Martindale, University of Hawaii. PBRC - Investigations of brachiopod development.

Susan Middleton, Photography of live marine invertebrates. Research and writing for a book focusing on marine invertebrates.

David Montgomery, University of Washington. Working on draft of manuscript of a geomorphology textbook.

Roger Morris, Writing prologue to book-in-progress, “Kindred Rivals,” a comparative study of the inner politics of America and Russia since 1917.

Allison Welch, College of Charleston. Study of the heritability of sexually-selected characteristics in gray tree frogs.

Lisa Levin, Scripps Institute of Oceanography. Analysis of faunal abundance, distribution, colonization, diversity and trophic (isotope) data associated with Pacific methane seeps and other reducing ecosystems.

FHL brings Science to the Islands' Classrooms

FHLSOP

by Jenny Roberts & Margo Thorp

Friday Harbor Labs Science Outreach Program staff is proud to announce the **10th anniversary** of providing unique science education opportunities to local 1st - 12th grade classrooms.

Several of our environmental monitoring projects have been ongoing for up to 10 years and involve students, resource managers, scientists and local businesses. Students learn about the importance of the monitoring projects for providing long term baseline data, and proper field procedures. They are involved in collecting and recording data that is shared with the community through our website, presentations, and reports. These data may act as an early warning system for resource managers. Involvement in monitoring projects, encourages students to become environmentally aware and scientifically educated stewards of local marine and freshwater environments.

Highlighted below are just three of our monitoring projects.

Jackson's Beach Fish Population Monitoring Project

– Since 2001 fourth graders from FH Elementary School have been conducting beach seines to identify and count fish in the intertidal zone. The data has been used by scientists from Friday Harbor Labs, Friends of the San Juans and the Northwest Straits Commission.

Water Quality Monitoring in FH Marina – Since 2002 FH Elementary School fifth grade students have been conducting a water sampling study six times a year at six sites in the marina to test water quality. Results are reported to Port officials.

San Juan Islands Watershed Monitoring Project – The watershed monitoring project was initiated in 2002 with the purpose of collecting baseline water quality data and educating local students about watershed health. Up until 2009, seven parameters were assessed to determine water quality in 12 watersheds on 3 SJ Islands every 6-8 weeks. Results were reported to San Juan Islands Conservation District, San Juan Public Health Dept and Dept of Ecology. Although the regular data collection has ended for this project, watershed education and field trips still occur with students at irregular intervals.

***Presently, FHLSOP is seeking funding to resume the Watershed Monitoring project.**

Please visit our website to learn more about our monitoring projects and the FHLSOP program at <http://depts.washington.edu/fh12/index.html>

Interested in supporting FHLSOP?

It's easy to donate online at: <https://www.washington.edu/giving/make-a-gift> (keyword: FHLSOP)

GK-12 Program

by Megan Dethier

FHL continues to be involved in a national program bringing graduate students into K-12 schools. We are now in our 3rd year of a 5-year program, funded by a National Science Foundation Graduate STEM (Science, Technology, Engineering, and Mathematics) GK-12 grant.

Through interactions with teachers and students in local schools, graduate fellows can improve their own communication skills while enriching STEM content, especially increasing ocean literacy among high school students. Graduate fellows receive an entire year of support, so that they work approximately half-time in this program and have the rest of their time to do their research or write their dissertations. During each year, the program supports 8 fellow-teacher partnerships in schools in Seattle (5-6 pairs) and San Juan County (2-3 pairs).

With the program now in its third full year, we have had two fellows teach on Orcas, one on Lopez, and three in the Friday Harbor High School in classes ranging from biology to oceanography to marine technology, chemistry, and physics. Fellows who have completed the program agree how difficult but rewarding it is to learn how to engage and teach high school students, especially the importance of hands-on activities to capture their attention.

Teachers unanimously talk about how much their students learn - not only 'facts' about the ocean but more importantly, how the graduate fellows provide role models for the value of higher education and for their passion about careers in science. San Juan County classes have made repeated use of the FHL research vessel Centennial to show students how oceanographic data are gathered. Fellows often take their students on field trips to local shorelines to study tides, marine habitats and water chemistry.

Photos by Jenny Roberts (left) and Margo Thorp (center / right)



FHL Scholarships, Funds and Endowments

Emily Carrington Student Travel Endowment

Supports travel for students at FHL

Ellie Dorsey Memorial Fund

Generates an annual gift presented to a student in memory of Ellie Dorsey

Patricia Dudley Endowment

Supports the study of systematics and structure of organisms and marine ecology

Ellis Preserve Fund

Supports activities in research and education connected to the Ellis Preserve on Shaw Island in honor of Marilyn and Frederick Ellis

Fernald Fellowship Endowment

Supports graduate students for studies of marine invertebrate development

FHL Adopt-a-Student Program Fund

Provides financial assistance to students attending FHL courses

FHL Discretionary Fund for Excellence

Provides funds for student aid and encourages diverse initiatives that benefit FHL

FHL Research and Graduate Fellowship Endowment

Supports graduate students and postdocs for marine science studies

FHL Research Apprenticeship Program Endowment

Supports the FHL Research Apprenticeship Program

FHL Science Outreach Program Fund

Supports staff, equipment, supplies and R/V Centennial use connected with educational outreach for local (K-12) school partners

Anne Hof Blinks Fellowship Endowment

Supports students of diverse backgrounds in marine science studies

Illg Distinguished Lectureship Endowment

Brings specialists to present lectures on invertebrate biology and to meet FHL students and researchers

Kohn Fellowship Endowment

Supports graduate study of invertebrate biology research and course work

Karel F. Liem Endowment

Supports research on fishes

Marine Field Equipment Endowment

Supports and maintains marine field equipment, including, but not limited to vessel maintenance and replacement

Marine Life Endowment

Preserves FHL foundation courses in Marine Algae / Botany, Comparative Invertebrate Embryology, Marine Invertebrate Biology and Marine Fish Biology

Marine Science Fund

A current use fund to provide student aid for courses the following year

Larry McEdward Memorial Fund

Provides annual support for a graduate student in memory of Larry McEdward

Mellon Mentor Endowment for Excellence in Research Training

Provides faculty salary in support of internship in marine science, matched 1:1 by the Mellon Foundation

Brooks and Suzanne Ragen FHL Endowed Scholarship

Provides financial assistance to graduate and undergraduate students conducting field or laboratory research or enrolled in a FHL class or workshop

Reed Undergraduate Endowment

Scholarships to undergraduates for study of marine sciences

Seagrass Conservation Fund

Promotes investigation, including student directed projects, of the relationship between natural and human-caused stress on seagrass survival in the NE Pacific

Kenneth Sebens Student Endowment

A current use fund to support students at FHL

Richard and Megumi Strathmann Endowed Fellowship

Supports graduate students working at FHL on natural and physical science problems of the Pacific Northwest

Stephen & Ruth Wainwright Fellowship Endowment

Fellowships for graduate students studying form and function of organisms

Dennis Willows Director's Endowment

Provides future FHL directors with discretionary funds for unbudgeted needs including student assistance

Help us reach our goals and help students experience FHL!

by Lesley Nilsson

FHL Advancement Board Leadership Chair

At the October bi-annual meeting of the FHL Advancement Board, the needs for the Labs were addressed for the coming year. Our primary goal is meeting the very generous match challenge from Henry and Holly Wendt for student support for the FHL Research Apprenticeship Program. It is difficult to fund this program, because granting agencies tend not to fund small numbers of students in a course, and yet, the Research Apprenticeships have been known to be life-changing experiences for the students involved, many of whom have gone on to make a career of the marine sciences.

Another challenge that the Board has undertaken is fundraising for the Adopt-A-Student program. Tuition, room and board for a FHL five-week class is approximately \$5000 per student. Research scientists from major universities around the world teach these courses with 10-20 students per class. Donors who "adopt" students help pay for the students' tuition and are encouraged to engage with the students while they are at the Labs. Funds for the students must be pledged or available by March 2011 so that scholarship funds may be awarded. A look at the FHL 2011 Course List demonstrates the Labs' unique opportunity to focus on the abundant living marine organisms around the San Juan Islands.

Fundraising for the FHL K-12 Science Outreach Program is also part of the Board's mandate. FHL fund-raising for this program comes from the always-popular Jazz at the Labs event. The FHL SOP is conducted in conjunction with the San Juan Islands' public schools and several private schools. Students participate in real science research projects and understand the importance of gathering evidence and asking good questions, and drawing conclusions from their work.

There is always a need for new infrastructure at Friday Harbor Labs as well, and we have a long-term outlook toward a new conference/outreach center as well as new laboratory space. As FHL hosts several conferences and seminars during the year, the facilities are strained for space and limited by the current facilities. In addition, a committee is looking into restoring the facilities at the Cedar Rock Preserve on Shaw Island, making the small existing building capable of allowing students and faculty to stay there while conducting their research and education.

The Board members are enthusiastic about the prospects for these projects and will be looking for support for all of them.

Thank you for your Support

We wish to acknowledge our many contributors for their kind and generous support of students and programs at FHL.

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Alumni News

We would love to hear from FHL "alums" and will include your news in future e-newsletters.

Please send items to
fhlnews@uw.edu

THANK YOU

From the Director's Office

FHL joins the College of the Environment

In the last FHL electronic newsletter, we announced FHL officially joined the University of Washington's new College of the Environment, as of July 1 2010. The College also found its first Dean, Lisa Graumlich, who joined the University in June of this year. Dean Graumlich visited FHL for the first time in August, and took part in the Global Ocean Ecosystems and Climate Symposium held here that week. During her visit, we had a special event to celebrate the entry of FHL into the new college, which was attended by faculty, staff, postdocs, students, and members of the FHL Advancement Board.

The College of the Environment was created to merge many of the disparate units of the University that deal with environmental research and teaching. Units were added over about a two year period, with Dennis Hartmann acting as Interim Dean while the assembly took place.

The College is now one of the largest of its type in the nation, including several academic units: Aquatic and Fishery Sciences, Atmospheric Sciences, Earth and Space Sciences, Forest Resources, Marine Affairs, Oceanography, and Program on the Environment, plus research centers: Climate Impacts Group, Environmental Institute, Friday Harbor Laboratories, Center for International Trade in Forest Products, Joint Institute for Study of the Atmosphere and Ocean, Olympic Natural Resources Center, Pacific Northwest Seismic Network, Precision Forestry Cooperative, Center for Quantitative Science in Forestry, Fisheries, and Wildlife, Quaternary Research Center, Stand Management Cooperative, Center for Sustainable Forestry at Pack Forest, UW Botanic Gardens, Washington NASA Space Grant Consortium, Washington Sea Grant Program, Water Center, and the Wind River Canopy Crane Research Facility.

New units are likely to be added, and existing ones expanded, during the next few years. In addition to the units making up the new college, individual faculty from other colleges, who so desire, can have joint appointments with units in the new college. Several of us at FHL already have such appointments.

Before July 1, FHL was administered under the Office of Research, by Mary Lidstrom, Vice Provost for Research, who has now become the University's Interim Provost, while our Provost, Phyllis Wise, serves as Interim President of the University following the departure of Mark Emmert to head the NCAA. Yes, it's complicated, as they say. Anyway, I extend my thanks to Provost Lidstrom for her very capable leadership and assistance to FHL for the past five years. Several of the new facilities and projects coming to fruition this year were made possible by her willingness to invest resources in FHL and its future.

So, what does all of this mean for those of you who plan to use FHL in the future? Although FHL will be administered through the new college, it will continue to serve the entire university, and the larger national/international scientific community as it



Dean Lisa Graumlich and FHL Director, Ken Sebens celebrate FHL joining the new College.

Photo by Emily Carrington

always has. The UW College of Arts and Sciences, for example, also has a strong presence at FHL, both in the form of faculty teaching and conducting research here and via many of the courses offered at FHL through the Department of Biology. Moving into the new college is not likely to radically change how FHL operates, but it will provide new opportunities for collaborations and educational programs. For example, I hope it will lead to expanded use of our terrestrial biological preserves – over 1400 acres on Shaw and San Juan Islands. Last year, a graduate course in Forest Resources focused on the tree species within the Pt. Caution preserve on San Juan Island, accessed by our well-trod “Fire Trail”.

During the last year, several committees were formed to review FHL's activities and financial status, and those reviews contributed to a Strategic Plan authored by a committee of FHL users and other UW faculty, chaired by the Director of FHL. Over the next year, we will be putting several parts of the strategic plan in place, which we hope will improve our financial future and make better use of the facility throughout the year. We are in very good company in the new college and we look forward to the new opportunities this change provides.

Your support is appreciated!

With decreased state funding and increased tuition, now more than ever, we could use your help. If you are able to send a donation, or make a gift online, we would be very grateful. If you'd like more information about supporting FHL, please don't hesitate to contact us.

- Ken Sebens, Director, sebens@uw.edu
- Adam Summers, Resident Associate Director fishguy@uw.edu
- Rachel Anderson, Advancement Coordinator rachelea@uw.edu
- Cara Mathison, Senior Director of Advancement College of the Environment, caram@uw.edu
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REU/Blinks Fellowship Program

by Adam Summers

The atmosphere at the Labs this past summer was super-charged by the twelve students participating in the NSF REU/Blinks fellowship program. Hailing from all corners of the country, this ethnically diverse and intellectually excited group took on research projects that included seagrass, sand lance, sea slug neurobiology and seabirds. Erica Flores, mentored by long time Friday Harbor researcher Billie Swalla, took her final presentation on the road to the Washington State SCAMP meeting and won first place. Several others will be giving presentations at SICB in Salt Lake City in Jan. 2011. All in all, it was a very successful first outing for this exciting program. For the program to continue to succeed, we need first rate mentors to step forward. Recommend a project and we promise you your choice of excellent students to work with over the summer. Students get a great research experience and a summer long course in how to become a scientist. The mentor gets great data, a ground floor look at prospective graduate students and the satisfaction of turning a young mind on to the importance of integrative organismal biology. Send an e-mail to Scott Schwinge (schwinge@uw.edu) if you have a project in mind or if you are a student interested in spending next summer at FHL.



Photo by Kathleen Ballard

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