

Intertidal Tidings

Quarterly E-Newsletter

Friday Harbor Laboratory, University of Washington



FHL's marine research by dedicated researchers and bright young minds for earth's needs tomorrow.

From the Director

[Business As Unusual](#)



Kenneth P. Sebens

I am certain almost everyone reading this newsletter is going through a similar experience—dealing with the current round

budget cuts at your university, in your department or laboratory or in your company. For most of us, these are the most serious budget cuts we have ever had to manage, with a few notable exceptions. So, it will come as no surprise when you hear that FHL is in the same leaking boat as the rest of you. For the next biennium, that began this July, FHL will have to make do with about ten percent less in its permanent budget, Read more in *Business As Unusual* (Page 3)

Two FHL Priority Support Opportunities

[Matching Fund: Ocean Acidification Facility](#)

A very important opportunity for FHL has just become a reality. The National Science Foundation has funded FHL for the establishment of an **Ocean Acidification Research Facility**, including in-water mesocosms, laboratory mesocosms and aquaria, and an analytical chemistry laboratory building (see Fall newsletter). This new facility will be the first of its kind, available to all users of FHL. Read more in *Matching Fund: Ocean Acidification* (Page 4).

[Student Support: Fall and Spring Quarters](#)

While FHL has offered courses every spring and summer, there has not been a regular program of fall courses, except for the research apprenticeships (which will continue). This fall, we are trying something new - a group of four courses that meet the requirements of the new Marine Biology Minor at UW, Read more in *Student Support : Fall and Spring Quarters* (Page 4)

Additional Articles:

[FHL Development Officer Bob Schwartzberg Retires](#) (Page 10)

Public Lecture on [Climate Impacts on Washington Coastal Marine Systems](#) (Page 10)



Read more in [Red Urchins Going with the Flow](#) (Page 4).

Kevin Britton-Simmons and Hannah Stewart were diving in 2007 when, surprised by a strong tidal current, they observed red urchins employing their strategy of lowering their profiles and holding onto rocks while waiting for the current to diminish. This led to previously unstudied research on the behavior of red urchins during periods of intense current forces.

Edith Widder, Co-founder and President of the Ocean Research & Conservation Association, made the audience roar with appreciation during her public lecture as the Illg Distinguished Lecturer in 2009. Read more in [Fireworks are Biological](#) (Page 6).



Trish Morse talks about a life-long study of interstitial organisms living between coarse grains of sand that started in 1970 at the Friday Harbor Labs, and continued intermittently on the Maine Coast, Florida, Belize, Brazil, Fiji Islands and France in her article [The Lifelong Excitement of Scientific Discovery](#) (Page 7).

Read about [My K-12 Experience at the Friday Harbor Labs](#) (Page 9) by Grace Willows seen here with her Father, Dennis Willows.



Barbara and George Von Gehr moved to Friday Harbor nine years ago and joined the FHL Development Advisory Board five years ago. The Von Gehrs did not expect that their work with the Labs would reap rich rewards for them which Barbara describes in [FHL Labs are a Vital Part of our Life](#) (Page 8).

Additional Resources:

[Support Opportunities](#) (Page 11)

[FHL Contact Information](#) (Page 12)



Table of Contents

<i>Kenneth P. Sebens</i>	3	<i>From the Director: Business as Unusual</i> The impact of budget cutbacks on FHL programs and news about new grants.
<i>Kenneth P. Sebens</i>	4	<i>Two FHL Priority Support Opportunities:</i> <i>Matching Fund: Ocean Acidification Facility</i> UW match of donations for construction of Ocean Acidification Research Facility,. <i>Student Support: Fall and Spring Quarters</i> Student financial aid needs for the fall new Marine Biology Minor courses, the spring ZooBot quarter, and the research apprenticeships in fall and spring.
<i>Kevin Britton-Simmons</i>	4	<i>Red Urchins Going with the Flow</i> Behavior of red urchins during periods of intense current forces.
<i>Billie Swalla</i>	6	<i>Dr. Edith Widder Illg Distinguished Lecturer in 2009</i> <i>Fireworks are Biological</i> Description of two lectures by Widder on bioluminescence.
<i>Trish Morse</i>	7	<i>The Lifelong Excitement of Scientific Discovery</i> A study of interstitial organisms around the world.
<i>Barbara Von Gehr</i>	8	<i>FHL Labs are a Vital Part of our Life</i> Member of the community becomes involved with FHL.
<i>Grace Willows</i>	9	<i>My K-12 Experience at the Friday Harbor Labs</i> Description of FHL inquiry-based environmental science program for elementary, middle and high school classrooms (K-12) of the San Juan Islands by a participant.
	10	<i>FHL Development Officer Bob Schwartzberg Retires</i>
	10	<i>Coming Public Lecture: Climate Impacts on Washington Coastal Marine Systems Nathan Mantua, PhD.</i>
	11	<i>Support Opportunities</i>
	12	<i>FHL Contact Information</i>

From the Director:
Business as Unusual



Kenneth P. Sebens

I am certain almost everyone reading this newsletter is going through a similar experience—dealing with the current round of budget cuts at your university, in your department or laboratory or in your company. For most of us, these are the most serious budget cuts we have ever had to manage, with a few notable exceptions. So, it will come as no surprise when you hear that FHL is in the same leaking boat as the rest of you. For the next biennium, that began this July, FHL will have to make do with about ten percent less in its permanent budget, in addition to losing our development officer position following Bob Schwartzberg's retirement. That position was funded from the Development Office on the main campus, and was not in FHL's budget – but it still hurts. We now will have the services of the development office in the new College of the Environment instead, and we have increased the hours and responsibilities for Rachel Anderson, Bob's former assistant.

The rest of our cuts came primarily from our teaching budget, and some of that will be made up by a fourteen percent rise in UW tuition in each of the next two years. We at FHL are well aware that increases in tuition, room and board, and fees for visiting researchers are only going to make it harder for students and others to attend classes and do research at FHL, so we hope to minimize such increases. UW tuition has been at the low end of the scale compared to other large state universities, so we expect FHL classes to still be very affordable to most students. Nevertheless, we had more students than ever tell us this past summer, that they could not attend our courses without additional financial aid, and we had less of that to give. All UW endowment distributions were cut in half this year, and our Adopt a Student program was also down a bit from last year. The good news is that we had a record number of applicants for summer courses, so they were still mostly full.

Coping with these budget cuts will not be easy as we try to maintain our existing courses and even add new ones. Our first Marine Biology Quarter is commencing this fall with new courses in marine biology, sociology, environmental research, and diving research along with a popular research apprenticeship in Pelagic Ecosystems, which has been offered each fall for the past six years. We are also trying to maintain our excellent research apprenticeship program, now entering its 11th year, and despite the cuts, we have retained UW funding for that purpose. The funding will be used to match other sources of funding from individual research grants, foundations, and other sources. Keeping our courses at their current level of excellence and availability will mean finding new sources of funding. We are starting an endowment for the apprenticeships, and we already have a very successful Marine Life Endowment for four of the summer courses, which is expected to begin its distributions over the next decade or so (not soon enough for this current crisis).

If we are not able to come up with new funding for our courses and research apprenticeships, the consequence will be that we offer fewer courses, which does not make the best use of our excellent facilities. We have increased our summer courses from six to eight, but may have to cut back to five or six. Our spring and fall programs will also face limitations, and we have considered offering them in alternate years if the budget situation gets worse.

And what about that stimulus we have all heard about? It is real! Whether part of the stimulus or not, new NSF grants to FHL and to FHL researchers have arrived over the past few months, which we will detail in the fall newsletter. Briefly, there have been four new NSF grants for subtidal ecological research, chemical stressors, algal biodiversity, and for a new Ocean Acidification research facility including a new analytical chemistry laboratory and both laboratory and in-water mesocosms. These grants will greatly increase research activity and graduate student research support at FHL. Some will help the research apprenticeship program as well, but they can't fill the holes in our teaching budget. That will have to come from elsewhere.

I know we ask our friends and alums to help support our programs and students every year, but this year is really different. Your support of our Adopt-a-Student program, or any of our other endowments and annual funds, can make a difference in whether our students are able to enroll or not, and perhaps in whether our courses will be reduced or eliminated. So, whether or not you have

supported FHL in the past, please consider getting involved this year. It is not just “business as usual”—it will be business as unusual!

[Return to TOC](#)

Two FHL Priority Support Opportunities

Matching Fund: Ocean Acidification Facility

A very important opportunity for FHL has just become a reality. The National Science Foundation has funded FHL for the establishment of an Ocean Acidification Research Facility, including in-water mesocosms, laboratory mesocosms and aquaria, and an analytical chemistry laboratory building (see Fall newsletter). This new facility will be the first of its kind, available to all users of FHL, and will include state-of-the-art instrumentation. The research focus will be on how changing ocean conditions affect local marine plankton, benthic animals and plants. This is a very timely and critical research field that is now in its very early stages. NSF funded FHL for \$275,000 of a possible \$350,000 total award (mostly for the instrumentation) and the UW has agreed to match this \$275,000 for a lab building. However, our Vice Provost for Research has made a generous offer to match an additional \$75,000 if FHL can raise another \$75,000. With that, we will have \$700,000 available for instrumentation, mesocosms and a new lab, rather than the \$550,000 (\$275,000 from NSF + \$275,000 from UW) we have now. The additional funding would mean a larger and better equipped laboratory building that will represent a huge advantage for FHL, to generate research for many years to come. We expect users to be funded from NSF and other sources for their projects using this facility. This facility will also be the location for several of our new Research Apprenticeships dealing with ocean change and its effects over the next few years. If you can help us with any part of the \$75,000 match, please contact the Director (sebens@u.washington.edu).

Student Support: Fall and Spring Quarters

While FHL has offered courses every spring and summer, there has not been a regular program of fall courses, except for the research apprenticeships (which will continue). This fall, we are trying something new - a group of four courses that meet the requirements of the new Marine Biology Minor at UW, and similar major/minor requirements at other universities. These courses are: Marine Biology, Scientific Diving, Marine Environmental Research, and Social Change and the Marine Environment. Meanwhile, following the recession of 2008, UW reduced the distributions from its endowments by half; that is where much of FHL's financial aid for students comes from, meaning we had

only half as much to give out this summer as last. Annual fund giving for student support was also down a bit from the previous year, which left us with very little capacity to help students in the new fall program, the spring ZooBot quarter, and the research apprenticeships in fall and spring. The best way to help students take part in these excellent opportunities at FHL is through the "Adopt-a-Student Program" where individuals can support one student at \$3000, or two at \$1500 each, and get to know the students and hear about their experience at FHL. With the increase in fees and tuition, plus a decrease in endowment funds, students are having a harder time affording a quarter at FHL; if you can help us support students in the fall 2009 and all 2010 programs, please contact Rachel Anderson (fh1dev@u.washington.edu).

[Return to TOC](#)

Red Urchins Going with the Flow



Kevin Britton-Simmons

One of the things I like about biology is that you never know when you are going to make an observation that will be the genesis of a new project. During the winter of 2007 my colleague Hannah Stewart and I were carrying out a SCUBA-based study of drift algae capture by red urchins (*Strongylocentrotus franciscanus*) in deep subtidal (90 ft.) habitats. During one of our dives our “slack current” window was unexpectedly interrupted by a strong pulse of tidal current. Hannah and I both instinctively dropped to the bottom, tried to make ourselves small, and held on tightly to the rocky substratum until the gust of current passed. While we waited for the current to diminish I looked around and noticed that some of the red urchins around us were employing a similar strategy: they had flattened down their spines, making their bodies more streamlined in the intense current. When I looked over at Hannah she was watching them too; a look passed between us and a

project was born. Back in the boat after the dive we spoke excitedly; were they really streamlining in response to strong currents? Could this behavior decrease drag forces, and therefore the potential for dislodgement during periods of intense current? Would they do this behavior in the lab?

A little bit of background on red urchins would be useful here. These animals grow as large as soccer balls and are thought to live as long as several hundred years. In addition to their large bodies (up to 20 cm diameter), they also have long spines (to 8 cm) that they use to capture pieces of drift algae (detrital algae). This capability allows them to feed on algal detritus, even in deep habitats (to >100 m) where attached, living algae are absent due to light limitation. Although this species is well studied due to its ecological and economic importance (it is commercially harvested in the San Juan Islands) this streamlining behavior is not described in the literature.

Our first goal was to describe the behavior quantitatively. We collected 10 red urchins and filmed their behavioral responses to current speed in a flume (a circular tank in which the investigator controls the speed of the water). To our surprise, every individual we placed in the tank flattened its spines at high current. Our second goal was to quantify the functional consequence of the spine flattening behavior. This would require careful measurements of drag on urchins with normal and streamlined spine orientations over a range of current speeds.



Red urchins feeding on drift algae (algal detritus) at a depth of 90 ft. in San Juan Channel.

Since training urchins to flatten their spines on command seemed like a long shot we took a model approach. We euthanized a few urchins, dried them with spines in normal or flattened (streamlined) orientations, and covered them in several coats of marine shellac. After epoxying some hardware to the inside of each test skeleton we attached them to a force transducer in the

flume to measure drag over current speeds ranging from 0 to 63 cm/s. Our measurements showed that the streamlined spine orientation dramatically reduces drag on a red urchin, especially at high current speed where this behavior can diminish drag by more than 30%.

At the time Hannah and I first noticed the streamlining behavior in the field I had been studying red urchins in the field for three years. How had I missed this behavior? Initially, other scientific divers at FHL told us that they had never seen urchins streamlining in the field. But after a few weeks we began to get anecdotal reports from other FHL divers, other scientists were confirming that this behavior does occur in the field. Urchins are **capable** of holding on so tightly to rocks that their test breaks when you try to pry them off, but it takes time for them to increase their attachment strength (using their tube feet). We think this streamlining behavior may be important for preventing dislodgement during periods of unexpectedly strong currents. Such events are commonplace in the structurally complex near shore habitats of the San Juan Islands. The streamlining urchins also taught me a larger lesson. Even the most well-studied systems and species have interesting secrets that have not been elucidated.



Photograph of urchin model showing "normal" spine-up orientation and a stream-lined spine-down orientation

[Return to TOC](#)

Fireworks are Biological

Billie Swalla



Edith A. Widder

We were fortunate to have Edith A. Widder as the Illg Distinguished Lecturer in 2009. Widder is a biologist and deep-sea explorer who combines her expertise in oceanographic research and technological innovation with a commitment to reversing the worldwide trend of marine ecosystem degradation.

Annual Paul Illg Distinguished Lecturer

Widder was the 11th Annual Paul Illg Distinguished Lecturer and visited San Juan Island and Friday Harbor Laboratories early in July with her engineer husband, David Smith. The endowed lecture series was established in honor of Professor Paul L. Illg, who made many important contributions as a scientist, teacher, mentor, and friend. Paul excelled as a faculty member in the University of Washington Zoology Department from 1952 - 1982. An expert in the biology of crustaceans, he participated in many summer sessions at Friday Harbor Laboratories. He invited world-renowned scholars to FHL to join him in teaching invertebrate biology and thus greatly enhanced the quality of the graduate program and research at the Laboratories. The lectureship endowment was established through memorial gifts by Paul's family, friends and colleagues to bring marine scientists to Friday Harbor Laboratories who do not often work here in order to facilitate new interactions among marine researchers.

Diversity of Marine Animals that Emit Light

This summer, Widder presented two lectures during her visit to San Juan Island. The first, Scientific Lecture, was on Thursday evening, July 2, at 7:00 p.m. in the FHL Commons. Widder's talk was entitled "Evolution and Adaptive value of Bioluminescence in

Dinoflagellates" and she presented an amazing lecture on the diversity of marine animals that emit light, especially in the deep sea. Edie Widder is a certified Scientific Research Pilot for Atmospheric Diving Systems and she has made over 250 dives in the JOHNSON-SEA-LINK submersibles. Her research involving submersibles has been featured in BBC, PBS, and Discovery Channel and National Geographic television productions. A specialist in bioluminescence (the light chemically produced by many ocean organisms), she has been a leader in helping to design and invent new submersible instrumentation and equipment to enable unobtrusive deep-sea observations. Her lecture discussed how and why animals in the deep sea have evolved so many different ways of emitting light. Sometimes the light attracts prey, sometimes is a warning signal to other animals and sometimes acts as an alarm system to frighten potential predators away. The audience sat captivated during the talk, then asked a number of penetrating questions before retiring to a more relaxed question and answer session on the porch of the dining hall during the ice cream social following her lecture.

On July 3, at 7:00 p.m. Widder presented a second talk for the public entitled "Bioluminescent Oddities and Wonders of the Invertebrate World" at the San Juan Community Theater. Liz Illg, Paul Illg's daughter and a long-time resident of San Juan Island was in attendance. Many of the public who attended said it was one of the best lectures they have ever seen. During this lecture Widder used a black light and various props to demonstrate the difference between fluorescence, phosphorescence, and bioluminescence that are all different ways that animals use to emit light.

Widder graduated Magna Cum Laude from Tufts University where she received her BS Degree in Biology and then her Masters Degree in Biochemistry and a Ph.D. in Neurobiology awarded at UC Santa Barbara. In 2005, Widder left Harbor Branch Oceanographic Institution where she worked for 16 years to co-found the Ocean Research & Conservation Association (ORCA), a non-profit organization dedicated to the protection of marine ecosystems and the species they sustain through development of innovative technologies and science-based conservation action. In September of 2006, based on her work with ORCA, she was awarded a prestigious MacArthur Fellowship from the John D. and Catherine T. MacArthur Foundation.

Seeing in New Ways



Working with engineers, she has conceived of and built several unique devices that enable scientists to see the ocean in new ways, including HIDEX, a bathyphotometer which is the U.S. Navy standard for measuring bioluminescence in the ocean, and LoLAR, an ultra-sensitive deep-sea light meter. Most recently, Edie created a remotely operated camera system, known as Eye in the Sea (EITS), which, when deployed on the sea floor, automatically detects and measures the bioluminescence given off by nearby organisms. EITS has produced footage of rare sharks, jellyfish, and discovered a new species of large squid, all in their natural habitats. It was a terrific experience for everyone to hear Widder's lectures and meet her and her husband David Smith in person. We are looking forward to next summer's Paul Illg Distinguished Lecturer with anticipation.

[Return to TOC](#)

The Lifelong Excitement of Scientific Discovery



Trish Morse

Last summer (2008), a graduate student from Auburn University walked into the University of Washington Friday Harbor Laboratories course in Developmental

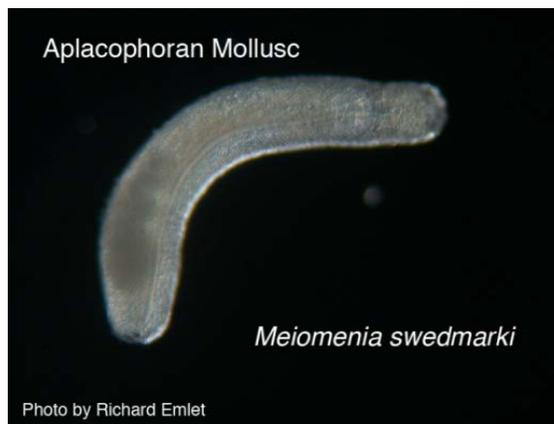
Biology. In his hand was a copy of a scientific reprint that he called to the attention of the course instructor, Billie Swalla. He was very interested in finding this very small mollusc featured in the article but, in his own words, was aware that this was written a *long* time ago (1979) and he was not sure if he would be able to find the organism. Billie took one look at the paper and declared, "...that author is Trish!" Thus began a re-entry into my work with the interstitial molluscs at FHL that began 1970's, and had been put on-the shelf.

New Importance

Suddenly, descriptive morphological understanding of a new species written 30 years ago, of an unusual and seldom seen class of molluscs, has taken on an importance in the studies of a new generation of students. One reason is the amazing growth of our knowledge about DNA, development of molecular technologies and development of exciting new experimental hypotheses. These new approaches are destined to lead to a better understanding of the relationships among the classes of the phylum Mollusca.



Rediscovering *Meiomenia swedmarki* Morse



We had an expedition. Dennis Willows took out the R/V Centennial and we used a Van Veen dredge, a box-like grab that brings sand from the bottom, to collect sand to

again look for this two-millimeter mollusc. Revisiting the original site in 58 meters of water over Reid Rock, just off San Juan and Brown Islands, we gathered the sand, returned to the labs, and extracted the minute interstitial organisms from the coarse shell hash sand. The interstitial species, *Meiomenia swedmarki* Morse, 1979 was there, much to the interest and excitement of the young graduate student from Auburn University.

It was back in the 1970, visiting the Fiskebäckskil Marine Laboratory on the West Coast of Sweden, that Bertil Swedmark taught me how to extract interstitial molluscs. Bertil, an expert on this group described many species from Europe, but none had been described from the United States. Professor Swedmark had been a visiting faculty member at the Friday Harbor Laboratories teaching with UW Professor, Paul Illg, in a summer course in Invertebrate Zoology. I returned to my home institution, Northeastern University Nahant Marine Science Center, and continued work on meiofauna on the Northern Maine Coast. My first studies at the Friday Harbor Laboratories began in 1977. Paul Illg had strongly suggested that I should come to Friday Harbor and study interstitial molluscs that he and Michael Hadfield had first collected in the 1960s. I have continued to work with this unique group of molluscs from coarse sand environments in Florida, Belize, Brazil, Fiji Islands (while on a Fulbright Fellowship) and in sand off of the coast of France.

Reid Rock Organism



In the summer of 2008, one of the FHL Invertebrate Zoology course faculty, asked me to talk to the students about interstitial organisms, that represent numerous phyla of invertebrates, all modified to live in between the coarse sand grains. A variety of species are well adapted to live in this special habitat. Besides their small size, interstitial organisms have developed special adhesive structures, greatly reduced organ systems, and tend to be worm-like in body form. Among the extracted

species is another new species of mollusc, a snail-like form with two pairs of tentacles and a creeping foot under its head-foot body mass. It is a species in the same group of gastropod snails of which I had previously described a similar species from Eastport Maine. I am presently working on describing this Reid Rock organism. This summer the Invertebrate Zoology course incorporated a session on interstitial organisms in the course syllabus with an expert, Eric Hochberg, as one of the instructors. I am so fortunate to be a scientist and experience the excitement of discovery. The study of interstitial molluscs has been a rewarding part of my entire career!

[Return to TOC](#)

FHL Labs are a Vital Part of our Lives

Barbara Von Gehr



George and Barbara Von Gehr with three FHL students they sponsored under the Adopt-a-Student Program

George and I began boating in the Seattle area in the mid 1990's, flying up from our California home. We first encountered beautiful San Juan Island from the water, cruising in from Seattle. I was always intrigued by the long low buildings lining the starboard shore as we approached Friday Harbor. As we explored the many interesting ports and harbors in the area, we often looked at available condos, but were never convinced to buy.

Labor Day weekend of 2000, as we embarked on a week of cruising, a surprise encounter with stubborn underwater rocks made us cancel our plans and limp into Friday Harbor, where we spent several unplanned days tied up in the marina. To enjoy the wonderful summer weather, we rented a convertible and began to explore the island – for the first time from the land perspective. It was a lovely, sunny weekend and we were seduced by the beautiful vistas and friendly people

we encountered all over the island. Yada, yada, yada, by the next April we were happy owners of a waterfront home in the woods on the southern tip of the island.

We rekindled a friendship with Tom and Barbara Cable, close neighbors on the Cape, who introduced us to FHL and eventually sponsored us for the Development Advisory Board (DAB). At last I learned about those puzzling buildings and even got the grand tour, as well as an outing on the *Centennial!* Having had our careers in business and finance, we were intrigued and impressed by the workings of this world-class research and teaching facility. Learning more about the scientific and academic worlds of FHL, we enjoyed the opportunity to bring our business experience to bear in a different context.

During our five year involvement with the board, we have come to appreciate the important basic research being done at FHL, as well as the unique and important learning opportunities it offers students – often their first experience with hands on research. It is exciting to hear the stories of students who have had life changing experiences there, and it has been a joy to be helping in some small way to make these opportunities possible.

The DAB and FHL staff and students make up multi-generational and multi-geographical communities, all impassioned about the work and mission of the Labs. Being involved with them has become a vital part of our life here on San Juan Island.

[Return to TOC](#)

My K-12 experience at the Friday Harbor Labs *Grace Willows*



Grace and her father, Dennis Willows

Many people use the Research Vessel Centennial for their research. The boat is not only used by biologists who are working at the Labs, but also by kids (like me!)

of all ages that want to learn about what scientists do at the labs. Students from local schools prepare for a visit to the Labs by learning about the animals they might see on their boat trip. In second grade, 3 years ago, my class read about invertebrates and then we went on a Centennial trip and actually saw some of the things we had studied. We came back to the Labs and each got a little glass jar with a specific animal from our trip. We answered questions and drew a sketch of the creature in the jar. Then we showed each other our animals.

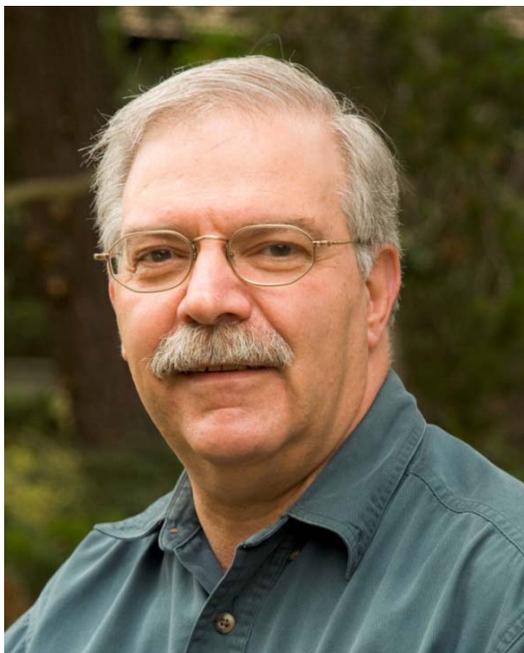
My dad is one of the skippers of the research vessel Centennial at the Friday Harbor Labs. When my mom is at work, and my dad is going to go on a Centennial trip I usually go with him. So I have more chances to see the organisms, large and small.

On the boat I've seen four different ways to observe animals and seaweeds. A bottom trawl is a funnel-shaped net with doors on the larger end. It usually brings up many big colorful things such as sea stars, shrimp and fish from the bottom. We also use the dredge, which is a steel-framed box with netted sides. It scrapes everything on the rocky floor of the ocean where a trawl cannot go because it would tear. For a plankton tow we use a mesh net that looks like stiff cheesecloth, made in the shape of a funnel with a plastic container at the smaller end. It collects plankton from different depths below the boat. The fourth method of observation is a transect. We look for seabirds, whales, seals, sea lions, and otters, near the boat and we record what we find along a specific route. This method requires just binoculars, notebooks and careful watching.

I think that many kids have been influenced by these K-12 field trips, because I have heard that they want to learn more and become marine biologists.

[Return to TOC](#)

FHL Development Officer Bob Schwartzberg Retires



Robert Schwartzberg

Robert (Bob) Schwartzberg retired as the Friday Harbor Labs Development Officer on June 30, 2009. Bob left an indelible impression on first-time Lab visitors as he convinced them that they had discovered a little-known gem of marine research and learning worthy of their attention and support. One thing was always clear. Bob thought that while FHL is not the largest University marine lab, its researchers and students are of the best and its research is essentially important. Bob, like other FHL staff and all of its researchers, was dedicated to the development of its students. He recounted endless stories of how they were inspired by their experiences with faculty and FHL resources to develop outstanding careers.

Bob assisted the staff and Advisory Board members to organize and greatly strengthen the Labs' development program. He established the annual Jazz at the Labs dinner and concert event to benefit FHL's K-12 Science Outreach Program. Jazz at the Labs now is recognized as a major musical event in the greater Seattle area. The number of endowments doubled under his watch and giving was greatly increased. Bob created the Sea Star Society for donors who contribute more than \$1,000 annually. He also created the Adopt-A-Student Program where individuals can support one student at \$3000, or

two at \$1500 each, and get to know the students and hear about their experience at FHL.

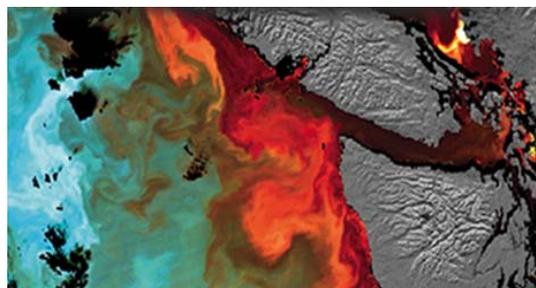
All at FHL are grateful for Bob's devotion to its growth. He was honored in an afternoon reception on June 19th at the Labs. We wish him success in his future endeavors. Bob continues to consult small non-profits in the Islands and across the country in his retirement.

[Return to TOC](#)

Climate Impacts on Washington Coastal Marine Systems

Public Lecture by Nathan Mantua, PhD

Monday, September 14, 7:30pm
San Juan Community Theatre
Friday Harbor, Washington



You are invited to attend this public lecture on the topic of climate impacts which are so important to residents of the San Juan Islands.

Nathan Mantua will give the keynote address at the 2009 FHL Research Symposium / PCC Summer Institute: "Pacific Northwest Climate: Past, Present and Future" which is hosted by the Friday Harbor Labs September 14th –17th. The UW Program on Climate Change is an interdisciplinary program in climate science that strives to integrate education, research and outreach activities on campus. It involves faculty from ten graduate departments and four research institutes working on climate change problems. The PCC Summer Institute's program is closed to the public. New this year to the FHL Research Symposium / PCC Summer Institute is the *Pacific Northwest Climate Impacts on Washington Coastal Marine Systems* Public Lecture that is open to the Friday Harbor Community as well as to the participants in the Summer Institute.

Nathan Mantua is an affiliate Assistant Professor of Atmospheric Sciences and Marine Affairs at the University of Washington, a full time research scientist with the UW's Climate Impacts Group, and the Assistant Director of the UW's Center for Science in the Earth System. Most of his current research is focused on regional impacts of climate on the water cycle, forests and marine ecosystems in the Pacific Northwest, and

how climate information is or isn't being used in resource management decisions. He received a B.S. from the University of California at Davis in 1988, and a Ph.D. from the UW's Department of Atmospheric Science in 1994. He spent one year as a postdoctoral Fellow at Scripps Institute of Oceanography working on a pilot project for the International Research Institute for Climate Prediction. In April 2000 he received a Presidential Early Career Award for Scientists and Engineers for his climate impacts research and public outreach activities.

[Return to TOC](#)

Support Friday Harbor Laboratories and Change a Student's Life

Each year FHL attracts more than 125 scientists and more than 250 of the world's most promising students.



Distinguished scientists work side by side with students on problems in marine biology, ecology, biomedical models, and many other fields. Interdisciplinary research has fostered important new lines of inquiry that are now pursued around the world for example, photoproteins from jellyfish are used in muscle and heart research and in an effort to eliminate malaria, a disease that kills a child every 30 seconds.

Students at Friday Harbor Laboratories evolve! Most notice a sudden transition to treatment as peers by faculty, graduate students and technical people. They perceive FHL as a bridge, from undergraduate to graduate status. Numerous FHL discoveries have contributed significantly to our scientific knowledge, but in the end, FHL's most important "products" are the **people**, the best and the brightest who develop their potential as students, teachers and researchers.

Friday Harbor Laboratories provides a life changing experience for many students each year. Along with these life-changing experiences, there will certainly be important scientific discoveries and new knowledge emerging from these students.

I hope that you will choose to make Friday Harbor Laboratories a life changing experience, by making

your gift now. I assure you, gifts of any size to FHL make a difference.

Thank you,

A.O. Dennis Willows
Professor of Zoology and Director Emeritus
Friday Harbor Laboratories

P.S. Take a moment to think back and recall those people who have helped you along your way. And then remember that there were those who helped you who you didn't even know.

Make a gift online

To make a gift online, go to the FHL https://secure.gifts.washington.edu/uw_foundation/gift.asp?page=funds&source_typ=2&source=EHU

You will be transferred to the University of Washington's **secure server** for private gifts.

For more information about supporting FHL, contact the FHL Director, Ken Sebens sebens@u.washington.edu or Rachel Anderson in the Development Office rachelea@u.washington.edu. FHL telephone numbers are 206-616-0760 or 360-378-2165.

Scholarship / Fellowship Funds

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

Fernald Fellowship Endowment:

Supports graduate students for studies of marine invertebrate development

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

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

Marine Life Endowment:

Preserves FHL "core" 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

Reed Undergraduate Endowment:

Scholarships to undergraduates for study of marine sciences

Richard and Megumi Strathmann Endowed Fellowship:

Supports graduate students focusing on problems in 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

[Return to TOC](#)

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Visit the FHL website <http://depts.washington.edu/fhl/> and click on People in the left side menu for listings of FHL staff, resident scientists and advisory board members.



[Return to TOC](#)