

Intertidal Tidings

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Graduate Student Research at FHL

by Richard Strathmann

In switching fields from anthropology to biology, Dawn Vaughn took courses at University of Washington Tacoma and also courses at the Friday Harbor Laboratories. Her FHL courses included a research apprenticeship on topics in cell biology, then courses in Comparative Invertebrate Embryology and Larval Ecology. Her performance in Larval Ecology after a previous 15 weeks of intensive studies indicated staying power as well as intelligence. Her aptitude for research was clear in her



Photo by Dawn Vaughn

Crab larva (the predator) with a snail larva near its dorsal spine. The crab larva is of one of the Cancer species (Dungeness crabs and their relatives). The snail larva is of the periwinkle *Littorina scutulata*.

collaborative projects in the larval biology course. I was pleased that she chose the graduate program in Biology at the UW. Her research has gone well.

One of my roles as an advisor is to help with the mechanical stuff: discuss research directions and experimental designs, help draft papers and grant proposals, critique talks to be given at scientific meetings, and obtain funds to support students' research.

My general role as an advisor is to help students discover the intersection of

what interests them, what they are good at, and what will interest other scientists. A student who has an aptitude for research can be ruined by too much control from the advisor. Dawn has an aptitude for discovery, enjoys it, and is demonstrating phenomena that are a surprise to her advisor as well as other researchers.

Predator-induced defenses of marine planktonic animals.

Predators induce the development of greater defenses in many kinds of animals in diverse habitats. These are often changes in form, such as thicker shells of snails or longer spines of crustaceans. Curiously, predator-induced changes in form had not been reported for marine planktonic animals, which occupy the largest habitat on earth. Dawn initiated a study of predator-induced defenses of planktonic larvae in a course at the Friday Harbor Laboratories. Through a grant proposal written with her advisor in 2006, she obtained funding from the National Science Foundation to expand her dissertation research at FHL. Her experiments test for predator-induced changes in form of marine planktonic animals that decrease their vulnerability to the predators.

Dawn's first experiments have shown that predators induce changes in shells of the planktonic larvae of a marine snail. The predators are crab larvae. The snail is a periwinkle, common on rocky shores. The crab larvae chip away the shell of a snail larva to reach the soft parts. The snail larvae develop shells with a narrower opening when crab larvae are in the water. The change in the larval shell does not require direct contact with the crab larva. Dawn compared survival of snail larvae previously exposed to the scent of crab larvae to unexposed larvae. The previously exposed larvae,

with smaller shell openings, survived longer when exposed to attacks by the crab larvae.

Dawn is extending these studies to other kinds of marine planktonic animals. If predators commonly induce marine planktonic animals to develop more effectively defensive forms or structures, then there are previously unsuspected consequences for survival, growth, and possibly duration of development. If, however, predator-induced defenses prove to be rare among marine planktonic animals, then the risks for marine zooplankton and the costs and benefits of predator-induced defenses differ from those for freshwater plankton. Dawn's next

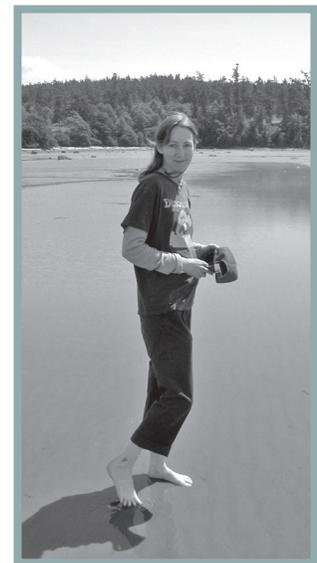


Photo by Kevin Vaughn

Dawn at FHL's False Bay Preserve, Friday Harbor

experiments were a surprise. Pluteus larvae of sea urchins and sand dollars have arms supported by a skeleton. Dawn's initial hypothesis was that small fish would induce development of longer arms, making the pluteus larva too big to fit in a small fish's mouth.

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San Juan Nature Institute now a UW Affiliate

In 2007, the San Juan Nature Institute (SJNI) became an official UW affiliated non-profit corporation. This status recognizes the close working relationship that has developed between the university and the institute. FHL and SJNI currently collaborate on K-12 programs, the winter lecture series, and the Marine Science Associates lecture series. Through this affiliation, SJNI has become an "outreach arm" of FHL, strengthening and expanding our ability to bring our science to the community around us. Several FHL-affiliated faculty and researchers have served as officers of SJNI including David Duggins, Arthur Whiteley and Val Viers.

SJNI already offers several non-credit workshops for adults each year at FHL and at other locations in the county. We expect to increase the scope and number of these workshops, using instructors provided by FHL, other UW campuses, and other experts recruited through SJNI. A good example was the September 2007 workshop on Kelp Biology given by Tom Mumford (WDNR) and retired UW professor, Richard Norris. Workshops will use the substantial natural terrestrial, freshwater and marine habitats throughout the more than 1000 acres of UW Biological Preserves on San Juan and Shaw Islands. In addition to preserving the biota of these special lands, research and education are integral parts of the university's mandate when the preserves were established.

In 2006, a Memorandum of Understanding was signed by the University of Washington Friday Harbor Laboratories (FHL) and The San Juan Nature Institute (SJNI), to document the agreement of both parties to create a Center for Science in the Community (CSIC). The purpose is to combine the resources of FHL, a major university science institution, and SJNI, a community based science education and outreach organization, to create an integrated science outreach and education center to benefit the citizens of San Juan County and adjacent regions. Though in the planning stages, we are already doing many of the activities we expect of this center.

Specifically, the goals of the new Center will be to:

1. Stimulate science-based learning to promote voluntary stewardship on the part of the citizenry to protect the ecosystems of the San Juan Archipelago;
2. Inspire and provide the opportunity for researchers, graduate students, faculty, and professionals in the fields of ecology, marine science and ecosystem-based management to translate the best available science into a vigorous, action-based education curriculum;
3. Facilitate the educational interaction between active scientists and motivated lay public, students of all ages, interested in issues affecting the local environment; and
4. Provide advice, research results, and opinions to county and state agencies and committees (e.g. SJC Marine Resources Committee) concerning ecosystem-based management and stewardship of the region's environment.
5. Collaborate on SJNI's Partners in Science, a field science program for elementary and secondary students, and on other K-12 Outreach programs.
6. Attract funding in the form of grants, corporate and individual gifts, and general public contributions to establish, maintain, and expand the Center's educational impact in the Island community.

It is anticipated that the Center will be implemented in two phases. Phase One will be a "virtual" Center which will exist as a group of programs and activities operated by each of the parties independently but coordinated by the Center. Phase two might be a stand-alone facility, located on the campus of the UW Friday Harbor Labs, staffed by both FHL and SJNI personnel and managed in accordance with the terms of our agreement.

FHL - A Life Changing Experience

Gretchen and Charles Lambert

"In June of 1964, we met at FHL as graduate students taking summer classes. I came from the University of Miami, Charlie from San Diego State University.

While walking back from town with my new roommate this tall handsome guy offered us a ride in his adorable little '39 Chevy. For me it was "love at first sight" (Charlie as well as the car!) and I think he must have felt the same way because that first weekend he invited me to drive around the island with him. It was a magical day. We explored and discovered the many beautiful places around San Juan Island. As the summer progressed we discovered our mutual love of marine biology, and discussed how lucky we were for the unique opportunity we both had been given to take classes at FHL thanks to the generous NSF grants administered and awarded by the Director, Robert L. Fernald.

I returned to Miami at the end of the summer, but my studies there did not last much longer; Charlie and I married a few months later in February 1965, and in September of that year we transferred to the University of Washington to continue our graduate studies. I received my MS degree in 1967, Charlie his Ph.D. in 1970.

We have returned to FHL many times for research, and Charlie has taught several summer classes. Our two daughters have always considered FHL their true home even though they grew up in southern California. We support a number of FHL scholarship funds to ensure the same opportunities that we were given in 1964."

Lloyd and Terri Matsumoto

When Lloyd came to Friday Harbor Labs in June of 1970, he expected an excellent education in a beautiful environment. He had heard the 'The Labs' were often referred to as a life changing experience. He soon found out how true that was.

Sitting next to him by assignment was a very attractive student named Terri. Six months later, Lloyd married Terri. Thirty-seven years later, Lloyd, a Professor of Biology at Rhode Island College, and Terri, a manager in the Pathology Department of Women and Infants' Hospital in Providence, Rhode Island, agree that FHL was a life changing experience in more ways than one.

Save the Date

Friday Harbor Laboratories presents
The 8th Annual

Jazz at the Labs

at Friday Harbor Laboratories

Saturday, June 7, 2008

Featuring Dennis Willows and
"The San Juan Jazz Quintet"

and returning by request Jay Thomas and
Seattle's Fabulous Jazz Group "Chimera"

**Jazz at the Labs supports the
Friday Harbor Laboratories
K-12 science programs in the San Juan Schools**

For information call Bob Schwartzberg
at 360-378-2165, ext.2

People at FHL

The Whiteley Center

The Helen Riaboff Whiteley Center at Friday Harbor Labs provides a refuge for established scholars, not only scientists but scholars in the humanities, arts, and music and just about every field from anthropology to zoology. Scholars may study, write, create and interact with collaborators in a peaceful and quiet environment. They can work in quiet isolation if they choose or they can take advantage of opportunities to mingle with other Whiteley Center scholars or students and marine scientists at FHL.

In 2007 the Whiteley Center will have hosted over 120 Whiteley Scholars, some for multiple visits. For more information on the Whiteley Center visit the web site on the FHL home page at <http://depts.washington.edu/fhl>

Some examples of the broad topics of work by scholars at the Whiteley Center include:

Barry Ache, University of Florida: Cellular mechanisms of olfactory transduction

Cliff Cunningham, Duke University: Promoting synthesis among disparate scientific disciplines

Matthew Gilligan, Savannah State University: Research on support for students in marine science degree programs at Savannah State University

Suzanne Hawley, University of Washington: Flares, magnetic activity atmospheres, mass and luminosity function of stars and the structure of the Galaxy using low mass stars

Jeanne Heuving, University of Washington, Bothell: The transmutation of love in twentieth century poetry

Suzane Holland, University of Puget Sound: Testing justice: genetic medicine and the medically underserved

Michael Honey, University of Washington, Tacoma: Manuscript on African American poet and songwriter of the 1930's, John Handcox

Phillip Howard, University of Washington: Politics online in the Muslim world

Joel Kingsolver, University of NC, Chapel Hill: An appropriate statistical model for how different characteristics of research activities affect research productivity

Brian Kirk, Seattle Central Community College: Percussion method book and curriculum development of a Music Theory distance learning course

Jeffrey Levinton, SUNY at Stony Brook: Marine Biology: Function, Biodiversity and Ecology

Tamara McGovern and Peter Marko, Clemson University: Post-glacial recolonization of the PNW by marine species pushed out of high latitudes during the last glacial maximum

Donald Rogers, Long Island University: Data analysis to determine the stabilities of transition states of free radical formation

Steven L. Tanimoto, University of Washington: Transparent assessment in online learning: making the user a partner in complex inference processes

David Tapley, Salem State College: Oxidative stress in thiotropic clams, including *solmya reidi*, which can be found in the Puget Sound/Vancouver Island region

Photography Workshop at Whiteley Center

This past August, the 2nd annual Friday Harbor Photography Workshop at the Helen R. Whiteley Center was devoted to the promotion of the art of traditional black and white photography. World famous photographer, Rod Dresser, a former assistant to Ansel Adams, led the weeklong workshop.

The workshop educated the participants in technical and esthetic principles of the art form – which includes field, darkroom and studio practice. The instructor, Rod Dresser, with the expectation that the student will understand his or hers work in context with other photographic artists, and try to recognize their development of a unique vision, critiqued the participant's work.

"San Juan Island offers a magnificent visual venue and the Friday Harbor Labs an intellectual stimulus for the participant that amplifies the learning experience" said Rod Dresser.

The six students selected to participate were chosen through a national juried competition. The workshop is sponsored by FHL Development Advisory Board members, Robbie and Jan Macfarlane and by Freestyle Photographic.

For more information about Rod Dresser and the Photography Workshop look at roddresser.com

From Russia With ... Galina

Galina Pavlova arrived at FHL in late October from the A.N. Belozersky Institute of Moscow State University to work with Dr. Dennis Willows for 10 months. They intend to work on the magnetic sense demonstrated earlier in the behavior and nervous system of the seaslug *Tritonia*.

Galina earned her doctoral degree from Moscow State University Biology Department in 1978 and is now a senior staff scientist at A.N. Belozersky Institute. She has published more than 60 papers on neurophysiology of the cerebellum, spinal cord, brainstem, cortex and control of movements in vertebrates and invertebrates.

In three previous visits to FHL between 1995 and 2003, Galina collaborated in studies with Dennis Willows and found that new neuropeptides discovered in *Tritonia* (TPeps) are neurotransmitters involved in control of movements including ciliary beating rate, widespread in other mollusks and associated mostly with motor systems.

Galina says that her productive studies at FHL depend, to a considerable degree, on the well organized support staff, goodwill of colleagues and on the refreshing fascination of this unique place.

Adopt a Student Program

The Adopt-a-Student program offers FHL supporters the chance to become involved with an individual student during their time at the Labs. The Adopt-a-Student sponsor funds a student who would otherwise not be able to attend FHL, and can then get to know the student by several means: an introductory letter, social events, seeing the results of the research, and whatever else may grow out of the introduction.

Unlike a contribution to an endowment or a capital campaign, the Adopt-a-Student donation will provide immediate results by making the critical difference for a deserving student. The amount needed to Adopt-a-Student is \$3,000.

This program means more to both the student and the sponsor than just the financial support. Since the student meets the family who is making their stay at Friday Harbor Laboratories possible, it adds much more to their appreciation of the support. This is evidenced by the following comment from a student:

"I whole heartedly thank you for your contribution. Without it I could never have attended this amazing and so very insightful class. I have achieved so much more knowledge and understanding than I ever expected and have learned an area of science that I am fascinated with, but did not know how to approach on my own. I have gained ideas and insights into how I might improve my own research as well as gaining a more clear foundation in concepts I had yet to master."

To the donor, this program allows an opportunity to interact with and understand what the student is studying, and also in many cases to develop a lasting friendship with the student. This is expressed by the following quote from a donor:

"While time was precious in this program it was a pleasure for my whole family (wife, children and grandchildren) to meet someone from Argentina, be shown his experiments at 'The Labs' and have an opportunity to have him to our home for dinner, where our whole family enjoyed the cross cultural experience."

In 2007, 38 students received financial aid from this program and we hope to increase that number for 2008. We hope that you will join Friday Harbor Laboratories in this program for 2008. In an effort to further this program we would appreciate it if you would consider discussing the "Adopt-A-Student" program with others you think might be interested in participating in this program to help students and Friday Harbor Laboratories achieve their academic goals.

At a time when financial stress causes 250,000 qualified students in the USA to either drop out of college or not enroll at all, the impact of gifts to this program is tremendously important.

For more information about Adopt-A-Student program, contact Bob Schwartzberg at rsberg@u.washington.edu or call him at 206-616-0760.

Vaughn (cont.)

Instead, the pluteus larvae multiplied asexually, becoming smaller. Many of the larvae produced embryo-like buds that detached and developed into new, smaller larvae. Larval cloning was previously known to occur in larvae of sand dollars, sea urchins, starfish, and other echinoderms, but in previous studies the stimuli were unknown or the cloning occurred in conditions favorable for growth. Dawn's research shows that sea urchin larvae also clone in response to fish mucus in the water, a cue that predators are present. The cloned larvae continued to be smaller than uncloned larvae through the rest of their development as larvae. The small size suggests a defense against visual predators. Dawn plans to test whether cloned larvae are indeed less detectable by fish and thus less vulnerable, as is expected from other studies of fish predation.

Her unexpected results offer a new ecological context for asexual reproduction: rapid size reduction as a defense. Although asexual propagation (cloning) occurs in many plants and animals, a search of the literature has, thus far, revealed no other report of cloning at any life stage in response to chemical stimuli indicating risk from predators. A working hypothesis is that cloning in response to predators will be found where safety lies in smaller size.

Such is the life of a graduate student at FHL. Dawn's story is just one of thousands over the 100 years of FHL's existence.

Lee Hood Joins Inventors Hall of Fame

Leroy (Lee) Hood, the world-renowned molecular biologist who created a DNA sequencer to map the human genome, was inducted into the National Inventors Hall of Fame this spring. He was chosen by a Hall of Fame committee for having "contributed to the betterment of society."

The DNA sequencer helped researchers more quickly identify thousands of genes in the human body.

Lee Hood is a former University of Washington professor, founder of the Institute for Systems Biology and a member of the U.W. Friday Harbor Laboratories Development Advisory Board.

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 post-docs 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 courses in invertebrates, algae / botany and comparative invertebrate embryology

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.

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.

2008 FHL Courses

Spring Quarter (March 31 - June 7)

The ZooBot Quarter:

- Marine Zoology
- Marine Botany
- Marine Benthic Ecology (Research Apprenticeship)

Other Research Apprenticeships:

- Parallel Evolution of Nervous Systems: From Genes to Behavior
- Marine Sedimentary Processes

Summer Term A (June 9 - July 12)

- Functional Morphology and Ecology of Marine Fishes
- Marine Algae
- Comparative Invertebrate Embryology
- Biomechanics
- Blinks Marine Science Research Internships (Term A & B)

Summer Term B (July 14 - Aug. 16)

- Marine Invertebrate Zoology
- Evolution and Development of the Metazoans
- Oceans and Life on Planets: Remote Exploration of Seafloor Microbial Activities

Autumn Quarter (Sept. 22 - Dec. 6)

- Pelagic Ecosystem Function in the San Juan Archipelago
- Assessing Predation Across Marine Habitats

Application and information available at:

<http://depts.washington.edu/fhl/>

New Giving Opportunities

WRF Challenge

Washington Research Foundation (WRF) has offered Friday Harbor Labs a challenge: raise \$71,000 in new gifts toward supporting a Research Apprenticeship Program in the spring of 2008 and WRF will match it dollar for dollar.

WRF President Ron Howell stated "We have long been supporters of the Research Apprenticeship Program. These small, intense classes provide an opportunity for full-time research training experiences that enable students to transition into young scientists almost from the first day. This challenge will enable more students to continue to experience this focused research opportunity." You can help FHL meet this challenge by designating a gift to FHL in support of the WRF Challenge.

R/V Centennial Operation Support Fund

"I believe that the heart of a marine laboratory is a quality research vessel" said FHL Development Advisory Board member Gordon Robilliard. "Therefore, in keeping with my belief I am making a special gift to FHL to support the operation of the R/V Centennial." The fund is limited in use to the purchase of supplies, equipment, repairs and fuel for the continued operation of the R/V Centennial.

Under Gordon's direction, each year 25% of the previous years balance in the fund may be used for the stated purpose. This enables the fund to grow and provide ongoing support.

Contributions to the R/V Centennial Operations Support Fund are being actively sought. Consider what the R/V experience meant to you and then make a gift to this new and important fund.



Photo by Jim Murray

FHL Contributors ...

We want to thank our many contributors for their kind and generous support of students and programs at FHL. Their interest in, and concerns for marine science are greatly appreciated.

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Gifts received as of November 14, 2007

You can make a difference... only if you have a will!

It's been estimated that nearly 2/3 of Americans do not have a will... and many of those that do have a will have not updated it in the past five years.

If you do not have a will, the government may decide who gets your money, property and other assets. It may, depending on circumstances, also decide who raises your kids, cares for your elderly parents, takes care of your pets, decides how much tax your estate pays and it won't make gifts to charities and nonprofits like Friday Harbor Laboratories.

If you have a will, even if you are not wealthy, you can make a gift to the University of Washington, Friday Harbor Laboratories that will have significant impact. A bequest to Friday Harbor Laboratories can be part of your legacy and support students, faculty, programs, a professor – whatever is most important to you. You can donate specific property, a fixed sum, or a portion of your estate, and receive an estate tax deduction for your bequest.

If you wish to make a bequest, please discuss it carefully with your attorney. Our suggested bequest language is: I give, devise, and bequeath to the Board of Regents of the University of Washington, Seattle, Washington, (specific amount, percentage of estate, or property description) for Friday Harbor Laboratories.

As the old saying goes ... "Where there's a Will, there's a way."

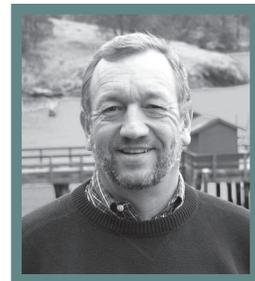
**For more information, contact:
Office of Gift Planning, Phone: 206-685-1001 or toll-free at
1-800-284-3679, Email: giftplan@u.washington.edu
Web site: <http://supportuw.washington.edu/giftplanning>**

From the Director's Office...

The past year has been one for the record books. FHL offered the most courses ever (16), had the largest number of applicants for courses (up 40% since 2005), and had the most applications for research space during the summer. We were so full, we had to rent housing off campus to accommodate all the summer researchers, even with our current capacity of 240 persons in the housing units. We also had an exceptional international population of students and faculty, with 42 students coming from 23 countries during the year. Support for our students was at an all time high; we were able to fund more than half our total requests for support, providing over \$350,000 in direct support for students in courses and apprenticeships. A big piece of that support came from our new "Adopt-a-Student" Program, which has been a real hit with our generous donors (and their adoptees).

In addition to ongoing activities in education and research, which have been strong for many years, we at FHL have also greatly expanded our outreach activities, where we bring our expertise, our enthusiasm, and our direct involvement to the local community. Our K-12 efforts continue to grow, with programs in the San Juan Island schools, and in collaboration with SJNI. An exciting addition to our K-12 efforts became a reality this fall, with the award of \$2,890,000 from the National Science foundation for a new GK-12 Program at UW FHL and on the Seattle campus (K. Sebens, D. Armstrong, D. Grunbaum, Principal Investigators). This new award will provide funding to fully support eight graduate students per year for five years, working with science teachers in the San Juan County and Seattle area high schools. Over twenty faculty from five UW departments and schools signed on to mentor their graduate students in this activity, which will begin in fall 2008. In addition to working directly in the schools, teachers and graduate fellows will take part in two workshops per year, at FHL and in Seattle, aimed at improving their skills and coordinating their efforts. This is an exciting undertaking that will benefit the schools, the teachers and our graduate students as well.

Some of those graduate students will live in two new graduate dormitories at FHL, funded by the NSF Field Stations and Marine Laboratories (FSML) Program and matching funds from UW (\$500,000 total). These two new buildings, scheduled for completion in 2008, will be located near dorm "O" our only existing dormitory designated for graduate student use, and incorporating kitchen, dining and living room spaces.



Another good example of FHL outreach is our participation in the San Juan County Marine Resources Committee, a very active and dedicated group of individuals who examine all marine related concerns within the county, and oversee the Marine Stewardship Area (MSA), comprising our county waters. Richard Strathmann and I are the current members from FHL, and both Dennis Willows and Terrie Klinger served in many of the previous years. The MRC was responsible for the establishment of voluntary no-take areas for rockfish, and for the establishment of the MSA. It is currently dealing with a diversity of issues including, orca protection, salmon restoration, effects of docks on eelgrass, oil spill preparation, vessel traffic effects, and many others. FHL scientists have a lot to offer the county, and many of them have been drafted to take part in these efforts, or have done so in their own way volunteering in the schools, non-profits, and many other venues.

The future holds even more exciting outreach activities, such as the joint efforts between FHL and SJNI (see p. 2), to found a Center for Science in the Community (CSIC) at FHL that will consolidate the outreach activities we already do, and add new ones as well. We envision a center where we can host larger presentations (lecture hall), and where we can hold K-12 activities on the FHL campus (wet – laboratory), and a space to present displays of the research being conducted at FHL, as well as offices for the outreach programs we already have, and expect to expand. Although this is a few years away, we can be proud of the many ways in which we already serve our local community, as well as the ways in which our findings will serve the larger communities of which we are a part.



Friday Harbor Laboratories

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