Intertidal Tidings

Quarterly E-Newsletter

University of Washington Friday Harbor Laboratories

From the Director

Whiteley Center Enriches FHL Campus

Kenneth P. Sebens

On May 2, 2010, Friday Harbor Labs celebrated the 10th anniversary of The 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. As part of this celebration, Fu-Shiang Chia, Dennis Willows, Vera Stasuk and I congratulated Arthur.....
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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 apprenticeships. The 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 (AB) to match their gift. If we are successful in finding funds to match their gifts, the final endowment could be as high as $1.5 million dollars.

Read about this fantastic opportunity and ways you can help the Labs meet the challenge on *Page 3*.

Staff, faculty and associates of FHL received many honors and awards this spring: UW 2010 Awards of Excellence, Science Education Advocate Award, National Academy of Sciences election, Kistler Prize and Kowalevsky Medal. Read about the recipients in *Honors to FHL Faculty, Staff, and Associates* Page 15.

Lisa Graumlich is appointed as the first Dean of the College of the Environment and Friday Harbor Labs will join the new College on July 1, 2010. More information about this emerging unit is found on *Page 16*.

Additional Resources:

H. Gary Greene maps the Salish Sea primarily to identify benthic habitat types that may be promising refuge for declining rockfish species such as yelloweye rockfish and other bottom fishes. Read more and see the fascinating maps in *Mapping the Salish Sea Floor* on Page 4.

Dianna K. Padilla's article, *Oysters are Cooler Than Rocks* on Page 9, is about research into increasing populations of the Pacific oyster, *Crassostrea gigas*, and Limpets in the San Juan Islands waters.

Dennis Willows explores 200 years of discovery and research in the Pacific Northwest and at Friday Harbor Labs that ultimately affects each of us. Read about Darwin, Vancouver and Shimomura in *FHL: A 200-Year Tapestry* on Page 11.

Dennis and Michael Wingren, M.D. converse on the medical applications of basic research performed by Shimomura on Page 14 in *FHL's Link to CCB Heart Treatment.*

Trish Morse describes the March 27th memorial held at FHL for Dr. Fred Ellis, Sr. on Page 18 in *Celebration of the life of Dr. Fred E. Ellis 1916 - 2010.* Click here *http://depts.washington.edu/fhl/fredellis.html* to read about Fred's inspiring life.

Highlighting: Dr. Steve Wainwright on Page 21 is the second in a series featuring major figures in the development and growth of FHL. Steve's colleagues honor him with wonderful memories and stories out of the past.

Enjoy more pictures of the Whiteley Center's 10th Anniversary along with Bill Calvin's and Arthur Whiteley's thoughts about the Center on *Pages 19 and 20*. Arthur highlights a few of the hundreds who worked at the Center over the years.

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Whiteley Center Enriches FHL Campus

Ken Sebens, Ph.D.

On May 2, 2010, Friday Harbor Labs celebrated the 10th anniversary of The 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. 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 have had a chance to meet most of them, join them for receptions, and attend their talks and musical performances. I cannot express how much richer FHL has become because of this unique facility. While I am very fond of marine biologists, and certainly enjoyed my time at FHL before there was a Whiteley Center, I can really see the difference it has made.

One major difference is that now a lot more people, in many fields, know something about FHL. Even at our own university, there have always been large numbers of faculty who barely knew FHL existed, let alone what goes on here. Now, there are at least a few faculty in every department who know something about FHL and its value to the university, which now includes the Center itself. The same principle applies nationally and internationally – FHL is better known, and respected, because of the Helen R. Whiteley Center. We are the only marine laboratory in the world that has anything of this nature. It makes us (even more) unique.

While our university's administration may care about having an excellent marine laboratory, there are only a few dozen faculty on campus who benefit directly from such a facility. With the addition of the Whiteley Center, suddenly 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 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. See more on Whiteley Celebration Page 19.

Editor's Note: Click here if you wish to learn more about opportunities offered by the Whiteley Center. Summer bookings are very popular. More space is available for proposed project uses during other times of the year.

An Endowment, a Challenge, a Fantastic Opportunity!

Ken Sebens, Ph.D.

In fall 2009, Henry and Holly Wendt indicated their intention to start an endowment for the FHL research apprenticeships. The Wendts made two gifts, in 2009 and 2010, to establish the endowment and to provide annual funding for apprenticeships during 2009-2012. The endowment will be completed by 2012.

The 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 (AB) 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 $1.5 million dollars.

Raising the matching funds is critically important. Some splendidly qualified students with limited financial resources cannot attend FHL programs this year 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 persons who should be part of the next generation of stellar marine researchers.

An Endowment , a Challenge, a Fantastic Opportunity! Continued

It is very important that we find new donors to help make this match. We have asked our regular donors, and AB members, for help with a number of projects over the past few years, and we really need to branch out. Can you make suggestions of people, foundations, or corporations we could contact? Such suggestions should be communicated to Rachel Anderson (360-278-2165, ext. 2), or Ken Sebens (360-378-2165 ext. 5) or Trish Morse (360-378-6394). We will follow up on each one, and your suggestions will be kept confidential. This is a fantastic opportunity to make the apprenticeship program a permanent part of the FHL experience, as it begins its second decade.

Editor's Note: Gifts to the annual fund, to support the apprenticeships, are also encouraged and can be considered part of the match. Click here to make an annual fund contribution. Contributions to the Adopt-a-Student Program can also be directed toward the apprenticeships, and will be part of the total. Click here for making a donation to the Adopt-a -Student Program.

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2009 Blinks Scholars
Photo by Kathleen Ballard

Mapping the Salish Sea Floor

H. Gary Greene, Ph.D.

Extensive seafloor mapping of the channels, sounds, straights and basins that form the Salish Sea has revealed a complex and dynamic benthic marine and estuarine environment. Slow but persistent mapping efforts undertaken in the past decade under an international cooperative program between the Geological Survey of Canada and Tombolo/SeaDoc Society has led to the production of high-resolution bathymetric, potential benthic habitat, and other thematic maps being used at Friday Harbor Labs for student and other research projects. To date approximately 80% of the San Juan Archipelago and southern Georgia Basin has been mapped (see Figure 1).

These data have been collected using a modern acoustic (sound) high-technology, multibeam echo sounder mapping system, similar in frequency and energy to a common echo sounder, but using many beams of sound instead of a single beam. This technology allows for complete coverage of the seafloor, in this case 200% coverage, which provides data that can be processed to a sub-meter resolution and presented in a photo-like image. A major effort is underway at the Labs to collect additional data that can be used to define and identify specific habitat types and to document ("ground truth") the interpretive habitat maps.

Although the surface waters of the Salish Sea are flat and calm during the summer and fall seasons the bathymetric images obtained during the mapping effort indicates that deep underwater storms blow throughout most of the year. These underwater storms are tide related with open ocean waters blowing through the restricted passages during flood tides and mixed estuarine waters trying to escape to the open ocean during ebb tides. The forces of these tidal pressures generate large and extensive underwater sediment wave and dune fields (see Figure 2), similar to what can be found on land in desert regions that are subjected to strong winds. Therefore the seafloor geomorphology and the organisms that live in this environment are testament to the hostile conditions on the seafloor.

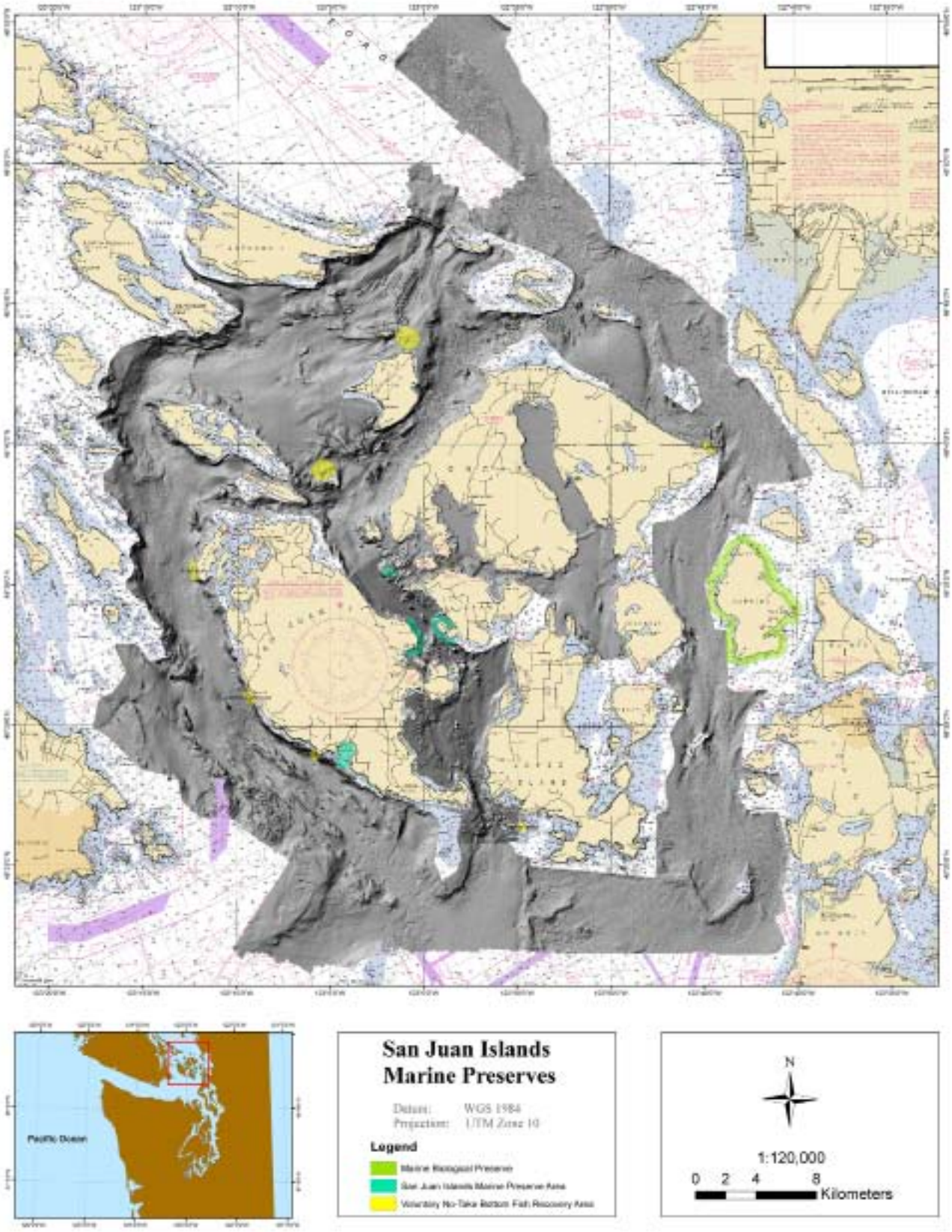

Figure 1
Multibeam echo sounder bathymetric image of the San Juan Islands Archipelago seafloor showing rock outcrops and scour from strong tidal currents. Colored bands around islands represent designated areas set aside for protection of rockfish and other organisms.

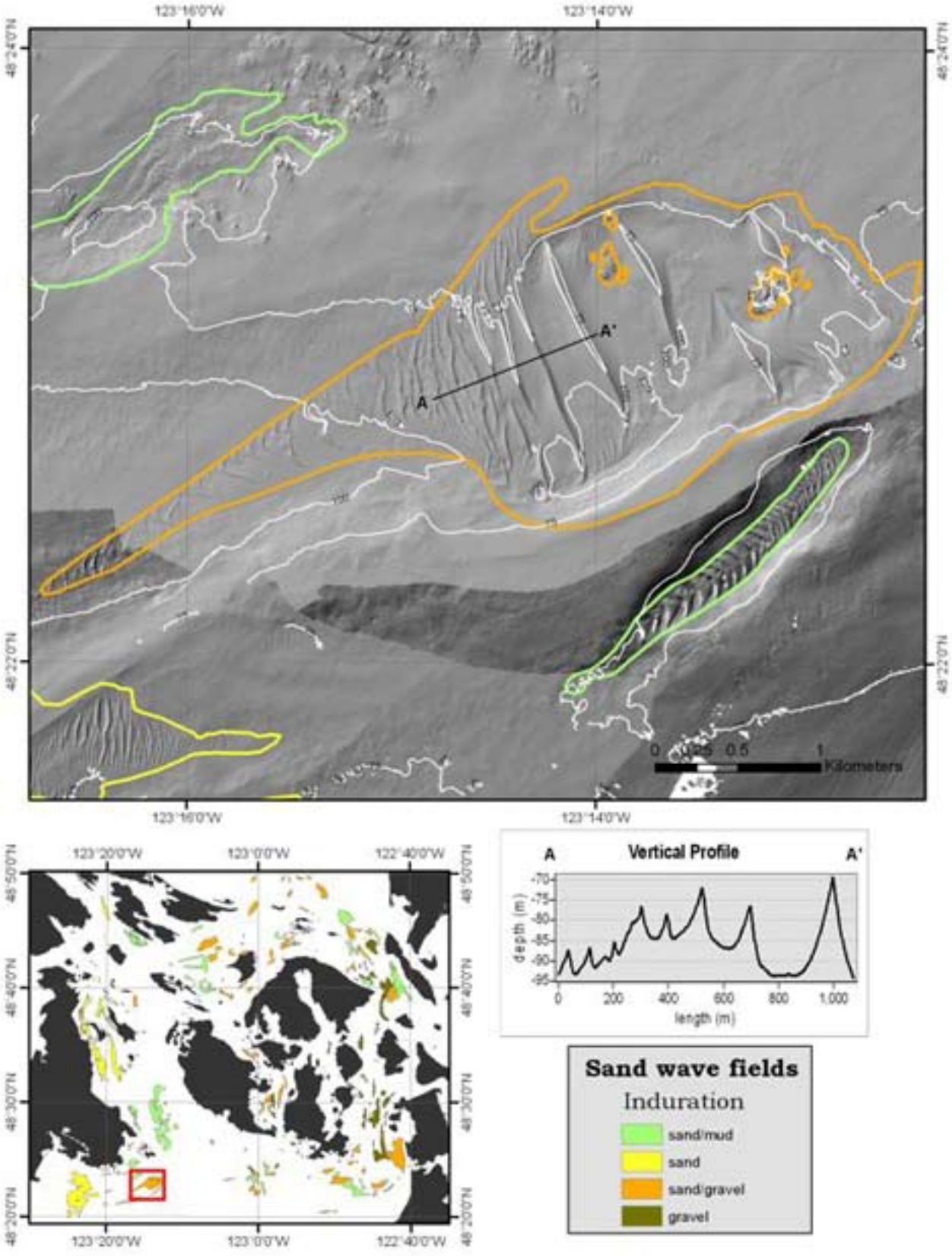

Figure 2
Bathymetric image of sediment wave field in southern Haro Strait. Note size of large wave, which is over 25 m high.

However, these modern dynamic features result from sediment produced from the last glacial advance and retreat and sit upon a structurally complex and ice carved rock surface as shown in the bathymetric images. The Salish Sea and its associated islands sit on the upper plate of what is known as the Cascadia subduction complex, a colliding sheet of rock pushed up by the diving and down going rocks of the Pacific plate. Resultant pressures of this collision and tectonic deformation are readily seen in faults and folds that are created from the tearing and ripping of the crust in this region (see Figure 3).

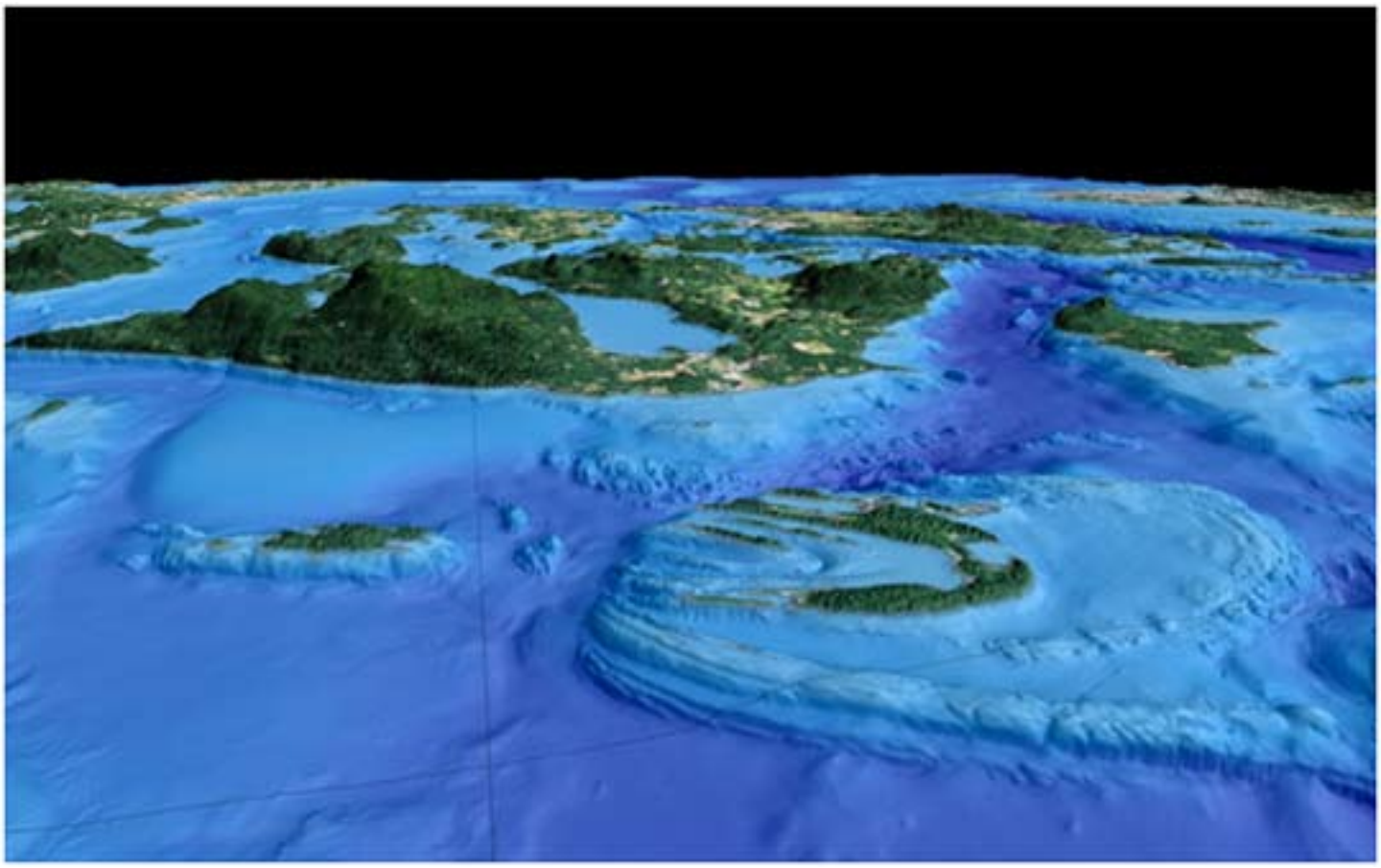

Figure 3
View of sea floor bathymetry from the north (Canadian side of the US-Canada border) that shows the tectonic deformation (folds) of rocks around Sucia Island that have been deformed along a fault that separates Sucia from Orcas Island (large island just south of Sucia).

The major objective of the mapping was to identify benthic habitat types that may be promising refuge for declining rockfish species such as yelloweye rockfish (*Sebastes ruberrimus*) and other bottom fishes. Therefore, areas of rocky substrate were focused upon as being potential habitats for rockfish. However, during the investigation it was discovered that Pacific sand lance (A*mmodytes hexapterus*), a major forage fish, occupied a dynamic sand wave field at a depth of 80 m in San Juan Channel, thus present-day efforts directed through the Friday Harbor Labs is to identify and map the distribution of these potential deep water sand lance forage habitats (more on this to come). Therefore, each of the potential benthic habitat types mapped to date in the Salish Sea (see Figure 4) need to be investigated to determine the biological community that exist— a daunting but necessary task. The value of the habitat map of the Salish Sea is that it provides a base upon which directed biological studies can be planned and implemented. The value of the bathymetric map is that other investigations such as potential geohazards (e.g., potential active faults) studies, which are presently underway (more on this to come), can be undertaken.

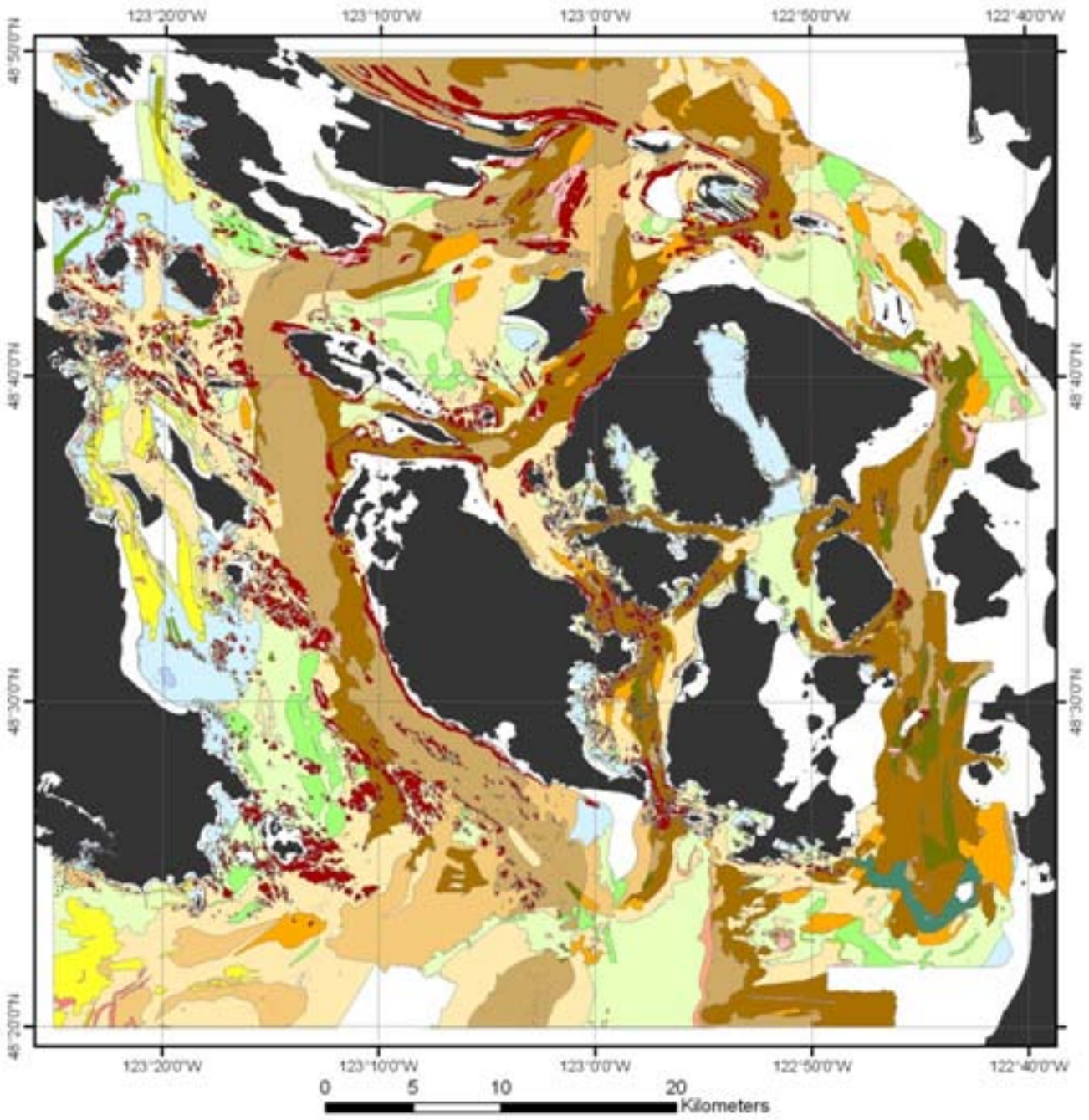

Figure 4

Potential habitat map based on interpretation of multibeam echo sounder bathymetric data. Areas in red are hard rock outcrops and other colors represent sediment with brown and orange representing dynamic sediment bodies such as scoured areas and sediment wave/dune fields and green representing glacial deposits.

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Oysters Are Cooler Than Rocks: Non-native Invaders in Marine Reserves

Dianna K. Padilla, Ph.D.

Oyster are extremely abundant in some marine reserves, such as Parks Bay, where they can exclude all other species normally found on the shore.
Photo by Dianna K. Padilla

Currently, marine reserves and protected areas are primary tools used to protect marine communities and near-shore fisheries. Like all habitats, these areas run the risk of impacts due to human activities. Humans have had and continue to have many impacts on natural systems. One of these impacts, the movement of species beyond where they are naturally found, has been practiced by humans for centuries. Sometimes this is done for food - such as agriculture or aquaculture. In other cases, just for aesthetics, such as the introduction of starlings to Central Park, as an homage to Shakespeare. However, one of the largest threats to local biodiversity is the introduction of species from distant sources, as these species have no long evolutionary history with the rest of the community and can often have dramatic impacts on local communities.

Such is the case for a relatively recent invader in the San Juans, the Pacific oyster, *Crassostrea gigas*. This species is well known to many of us who enjoy eating oysters, especially oysters grown here in Pacific Northwest waters. The Pacific oyster has been grown in aquaculture in Washington State and British Columbia for decades, where the cold, nutrient rich waters produce sweet, wonderful tasting oysters. In fact, the Pacific oyster is the most widely grown shellfish species around the world, and aquacuture production of the Pacific oyster swamps all other shellfish species combined.

The name *Crassostrea gigas* clearly fits this intertidal zone giant. Oysters grow so large that we had to get special calipers, designed to measure trees, to measure their diameter. This individual is about 9" long.
Photo by Dianna K. Padilla

The cold Pacific northwest waters that produce great tasting oysters also prevent these introduced animals from spawning. They are native to Japan, where the waters are warmer, and will not spawn until waters are 68°F (20°C), which is much warmer than our local waters. In an effort to establish a viable aquaculture industry, Dan Quayle, a Canadian marine biologist, set out looking for areas on Vancouver Island and mainland BC where the waters could warm enough to allow spawning and provide seed for aquaculture. He found several bays on Vancouver Island and Boundary Bay just north of the US-Canada border worked well in warm years, but seed production was unreliable. Eventually hatchery practices developed such that natural seed production was no longer needed, as animals could be spawned in the hatchery by warming the water, and techniques were developed that allowed managers to grow larvae in large enough

Oysters Are Cooler Than Rocks Continued

numbers to produce seed for production. However, the local feral populations that were established still remain. Pacific oysters are very long lived (up to 30 years), thus successful production of young is not needed each year to keep the population going. Similar feral populations were established in lower Puget Sound, but the waters of the San Juans were always too cold to allow spawning, protecting local shores from invasion by this species.

Blinks Fellow, Maria Aguilar, measure the surface temperature of oysters and size-matched rocks in an experiment. We found that oysters maintain a much cooler surface temperature than rocks, reducing the heat stress experienced by other organisms found on their surface.

Photo by Dianna K. Padilla

In the mid 1990s something changed. When sampling local marine reserves in 1997, especially at the mouth of the False Bay marine reserve, we discovered that a large number of Pacific oysters had set on the shore. We surveyed a number of sites around the island, and found they were in some areas, but not others. Over the next several years we found continued settlement of oysters, and by 2000 they were found in all of the local marine reserves, and their densities were increasing. We have been following this species since that time, and are trying to assess the impacts of this species on shoreline communities. Surprisingly, we have found that oysters are more abundant within the marine reserves than other close by sites, even areas where the public does not have access.

What do we know thus far? We have experimentally demonstrated that these oysters cannot reproduce in local waters. Even in very hot summers, local water conditions are too cold for successful spawning or local larval development. Therefore, the oysters invading our shores are coming from elsewhere - but we do not know where just yet. We do know that this invasion has an impact on local biodiversity, and when oysters are present, fewer species that are normally found on the shore are present.

One intriguing fact we have found is that limpets, small cap-shaped snails, are far more abundant on and around oysters than they are when oysters are absent. We hypothesized that the white oysters may be much cooler than the black rocks found on our shores, and that this difference in color may be affecting temperature-sensitive species such as limpets. Indeed, we have found that oysters are much cooler than the rocks - and the difference is big enough to affect the limpets. In experiments last summer with a Blinks Fellow, Maria Aguilar, we found that the difference in temperature also translated to differences in mortality and growth of limpets. Limpets survived and grew more on oysters than on matched rocks. We will be following up this work with additional experiments that will, hopefully, tell us whether this difference in temperature affects the rest of the community, as well as what it means for the limpets.

Close up of one species of limpet, *Lottia strigatella* on an oyster shell.

Photo by Dianna K. Padilla

Limpets are especially abundant on the surface of oysters. These grazers can be so abundant that they remove all other species that may settle on the oyster shell.

Photo by Dianna K. Padilla

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FHL: A 200-Year Historical Tapestry

Dennis Willows, Ph.D.

The Centennial of the University of Washington Friday Harbor Laboratories is closely interwoven in a splendid historical tapestry. The weave includes bright interconnecting threads linking the lives of a number of particularly interesting people and events across a longer period, stretching back over 200 years. I am thinking of the particular warp of historical threads involving George Vancouver, Charles Darwin, Trevor Kincaid, Frank Johnson, Osamu Shimomura, Graham Hoyle, and John Blinks. These are all exceptional people. Some like Vancouver risked life and limb to achieve discovery. Others invested lifelong intellectual effort to understand highly complex features of the natural world.

Darwin Vancouver Shimomura

All have been profoundly curious about the unknown. And further, all seem to have recognized that there are different kinds of things we do not know about. First the obvious kind …. there are many things we know we do not know about. But less obvious, there are even more important things we do not even yet know we do not know about. This latter comprises a long list of topics about which we cannot even ask good questions.

For example, there are many people walking around today who wouldn't be walking around without the help of certain pharmaceuticals (viz., calcium channel blockers) based upon brilliant discoveries of the past 40 years that show how calcium regulates (heart) muscle contractions. If we could place ourselves in the San Juan Islands a little over 200 years ago, we could have encountered George Vancouver, and could have asked the question, what causes many people to die of heart failure? Vancouver was an ambitious and very capable navigator, and he probably would have found the question interesting. But he wouldn't have had a chance in the world of posing a sensible question about how heart muscles contract, much less answering this one.

Vancouver's Ship: HMS Discovery

Peavine Pass

Balanus nubilis

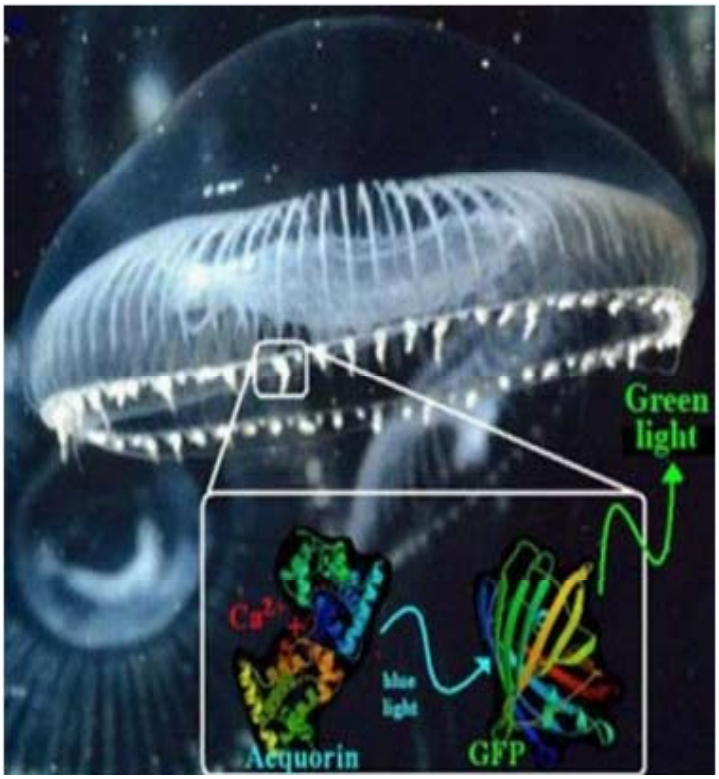
Yet there is an intimate linkage from Vancouver that leads to the present and to an answer. He had on board his ship a physician whose responsibilities (and curiosity?) led him to collect some strangely huge barnacles perhaps scraped up on an anchor hoisted from some deep local channel (my guess is Peavine Pass near Orcas). He apparently preserved them (gin?) and returned them to the British Museum of Natural History in London in 1792 where they sat, collecting dust for over 60 years.

Trevor Kincaid

But then Charles Darwin, having completed his world voyages, and great work on Origin of Species, was apparently wandering through the British Museum and noticed these fist-sized barnacles from the Pacific Northwest, and was curious about this apparently new species. Although it is not widely known, Darwin was a world class expert on barnacles and had published much on these crustacea earlier in his life. In any case, his curiosity got the better of him, he picked them up and studied them carefully, then wrote a meticulous description in a Ray Society Monograph giving them the name, *Balanus nubilis* (Darwin).

Then early in the 20th century, a brilliant, curious naturalist from the University of Washington, Trevor Kincaid was exploring the region around the San Juan Islands looking for a place to locate a marine station to expand the scholarly horizons of its students, and (not coincidentally) satisfy his own curiosity about marine animals. Because of the extraordinary biological diversity he noticed locally, Kincaid settled on Friday Harbor for the station, one hundred years ago.

Another 60 years passed, then Frank Johnson and Osamu Shimomura from Princeton University working at Kincaid's now mature marine lab in Friday Harbor were curious about how and why a local jellyfish, *Aequorea*, luminesces a beautiful blue-green color. To make a long story short, a legion of local children were recruited to collect tens of thousands of these creatures (at two for a penny) from the local docks. Johnson and Shimomura purified and characterized the light emitting photoprotein. Even more importantly the essential role of calcium ions in causing the jellyfish protein to glow was established.



Click to visit the GFP web site

About this same time, Graham Hoyle, recently transplanted to University of Oregon from University College London, attended an after-lab party at FHL where barnacles were served as hors d'oeuvres …… very fortunately, Darwin's barnacles, the same huge crustaceans Vancouver had picked up nearly 200 years earlier. Hoyle noticed that the barnacle muscles he was eating appeared to be made up of enormous cells, probably the largest muscle cells in the animal kingdom. Hoyle was profoundly curious about these muscles because he and nearly everyone else in the field of muscle physiology at that time wanted to know what makes muscle cells contract when they are stimulated by a nerve.

To make this >200 year story complete, and answer the question posed at the beginning (the one that would have stumped Vancouver), Graham Hoyle, and especially John Blinks (present at this Centennial) plus colleagues like Ellis Ridgway (Medical College of Virginia), Christopher Ashley (Oxford University) and Albert Gordon (University of Washington) working at FHL and elsewhere took advantage of the size of these enormous barnacle muscle cells and injected jellyfish light-producing proteins to discover and measure the essential role of calcium in activating muscle cells. In summary, jellyfish molecules, injected into barnacle muscle, yielded secrets about how a human heart works (and sometimes doesn't work).

Notice too that none of the brilliant contributors to this >200 year saga, until perhaps the most recent 40 years would have had even the vaguest notion of where the sequence was leading. Friday Harbor Laboratories played a crucial role in the achievements of all, from Kincaid to the present. And by the way, even this particular story contains several threads that lead off in other unexpected directions, some with additional extraordinary impacts in biology and medicine. There are many more FHL stories like this that one could tell, but even more that we don't yet have a clue about.

Kincaid doing field work

Trevor Kincaid founded the FHL in 1904 explicitly to provide a substrate for curious people. It is that same objective, viz., to provide a place that rewards curiosity, scholarly risk-taking, and encourages discoveries and new knowledge, that remains FHL's focus, and forte today. With luck, and with the steady support of its leaders and alums, it can go on doing the same for at least the next hundred years.

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Dennis Willows

FHL's Link to CCB Heart Treatment

A Conversation

Dennis Willows, Ph.D. and Michael Wingren M.D.

Michael Wingren

Dennis:

For the Centennial celebration of the Friday Harbor Laboratories in 2004, I described some research highlights of FHL's first hundred years. One of these highlights was the role played by FHL alums in figuring out how ionic calcium controls muscle.

In a round about way, that later triggered a conversation with a friend, Dr. Michael Wingren, a family physician who practices at the Inter-Island Medical Center in Friday Harbor. With Laura Long's encouragement, Michael and I had both been thinking about ways to better link together the work of FHL scientists, with the practice of medicine.

I asked Michael, what symptoms a person would present that might cause him to prescribe calcium channel blocker medications? He told me calcium channel blockers are widely used in medical care. Cardiac syndromes from simple hypertension to advanced congestive heart failure, cardiac arrhythmias, and coronary arterial blockage (myocardial infarction) are all treated commonly with calcium channel blockers (CCBs). But, CCBs are also used in treating cluster migraines, Reynaud's phenomenon (cold hands and feet), and even high altitude pulmonary edema - though Viagra works better!

I had no idea so many different medical problems were treated with calcium channel blockers. What would treatment options have been prior to CCBs, e.g.,50 years ago before the physiological work that unraveled mechanisms of muscle regulation by ionic calcium? Michael said that until the early 1960s, doctors had few medications to use for all these conditions. Reserpine - an herbal sourced drug that caused depression - and diuretics were mainstays of treating hypertension. Nitrates and hydralazine - which commonly cause headaches - were used to produce the vasodilatory response we now accomplish with CCBs with far fewer side effects. Improvements in drug therapy, combined with the adoption of coronary care units, better emergency care and primary care have all combined to decrease death rates due to heart disease, although not as much as hoped for due to increases in obesity related risk factors of diabetes, high blood pressure and high cholesterol.

In simplest terms, how do channel blockers work?

By and large, CCBs block entry of the positive cation calcium into muscle cells, thus decreasing binding of calcium to troponin, and decreasing actin-myosin interaction which would result in muscle contractility. Thus, CCBs generally cause vasodilatation - the relaxation of blood vessel walls. This can result in greater oxygen transport along those same blood vessels to otherwise oxygen starved tissues, a general decrease in blood pressure, a decreased likelihood of arrhythmias, etc. CCBs are used in acute and chronic care of many cardiac conditions and generally decrease the frequency and severity of hospitalization and poor outcomes. They are generally well tolerated, and it's not common for patients to develop resistance or hypersensitivity over time. Side effects can occur on any medication, and the gold standard of medications clearly improving longevity and quality of life are awaiting longitudinal studies.

Michael:

What part did FHL scientists play in all this?

Dennis said as recently at 1960, no-one understood how muscle contracted. Although all kinds of ideas were tossed around, there was only a suspicion that ionic calcium (Ca++) had something to do with it. But the research was up against the hard facts that muscle cells known to science at that time were small (dimensions of single human hairs), hard to isolate in good functional condition, and there was no way to measure the relationship between excitation, Ca++ concentration, and muscle contraction at the level of single muscle cells.

There were many (at least 50) scientists worldwide working on the problem of the mechanism of regulation of muscle contraction at the time. But a few FHL scientists played significant roles in breaking through these difficulties. Some of these were Osamu Shimomura (Princeton University), John Blinks (Mayo Clinic), Graham Hoyle (University College London), Ellis Ridgeway (Medical College of Virginia), Christopher Ashley (Oxford University) and Albert Gordon (University of Washington). And one mustn't overlook the crucially important marine organisms in this story, viz., the glowing jellyfish *Aequoria victoria*, and the local barnacle *Balanus nubilis* first described by Charles Darwin.

Shimomura isolated, purified, and provided for other people to use, aequorin photoproteins from glowing jellyfish that he and colleagues discovered at FHL. He quantified the relationship between the intensity of the 'glow' and the miniscule quantities of Ca++ present, and recently (2008) won the Nobel Prize for this work. Without these photoproteins to indicate the Ca++ in the muscle cells we might still be thrashing around trying to figure out how muscles work, 50 years later.

The other FHL researchers in this decade-long saga, figured isolated muscle cells from barnacles. These are the largest muscle cells known in the animal kingdom and they permitted experiments to measure simultaneously excitation, force, shortening, AND the amount of calcium involved in the contraction. This is how we now know that calcium ions regulate muscle contraction!

Dennis:
It is curious that diverse human muscle maladies are now treated with calcium channel blockers due in part to discovery of glowing molecules isolated from jellyfish that were injected into barnacle muscle cells!

Return to TOC

Honors to FHL Faculty, Staff, and Associates

University of Washington 2010 Awards of Excellence

For 40 years, these awards have honored outstanding members of our UW community for their performance in teaching, mentoring, librarianship, public service and staff support. Congratulations to the following FHL individuals who will be honored at a special ceremony on June 10, 2010, in Meany Hall.

- **Terrie Klinger,** Marine Affairs received the Outstanding Public Service Award which is presented to a faculty or staff member to honor extensive local and/or national and international service.

- The maintenance crew team of **Thomas Campbell, Fred Ellis, George Iliff, Richard McCarthy, Thomas Pieples** and **Jeffrey Seitz,** Friday Harbor Laboratories received the Distinguished Staff Award which is given to staff who contribute to the mission of their unit or the University, respond creatively to challenges, maintain the highest standards in their work, establish productive working relationships and promote a respectful and supportive workplace.

FHL Maintenance Crew
Photo by Kathleen Ballard

Science Education Advocate Award

Daniel Grunbaum, associate professor of oceanography, and science advocate, has received one of five **Science Education Advocate Awards** given this year by the Washington State Leadership and Assistance for Science Education Reform, a statewide group that helps school districts implement ongoing, research-based science programs. As part of the awards program May 3,2010, Gruunbaum and the other winners were part of a roundtable panel discussion about science, technology, engineering and math education.

National Academy of Sciences

Emeritus Professor **Lynn Riddiford** has been elected to the **National Academy of Sciences**. Lynn taught Research Apprenticeship programs at FHL Spring 2003: Developmental Endocrinology of Arthropod Embryogenesis, Spring 2005: Developmental and Behavioral Endocrinology of Arthropods. and Spring 2007: Evolution of Developmental Mechanisms in Marine Arthropods, demonstrating the excellent learning opportunities for students at FHL.

Foundation For the Future $100,000 Kistler Prize

Emeritus FHL Advancement Board member**, Leroy Hood, M.D., Ph.D. 2010** is winner of the **Kistler Prize** [http://www.futurefoundation.org/awards/kpr_home.htm]. The Prize has been awarded annually since 2000 to honor original work that significantly increases knowledge and understanding of the relationship between the human genome and society. Dr. Hood, Co-founder and President of the Institute for Systems Biology [http://www.systemsbiology.org/], Seattle, is one of the world¹s leading scientists in systems biology, biotechnology, immunology, and genomics.

Congratulations to Emily Carrington for promotion to full Professor status.

Northwest Algal Symposium Group

Emeritus Professor Bob Waaland has received the **Phycologist of the Year Award** from this pretegious group.

Scientific Council of Saint-Petersburg Society of Naturalists 2010 Kowalevsky Medal

Dr. Mark Q. Martindale, has won the 2010 Kowalevsky **Medal for Comparative Embryology**. The Kowalevsky Medal is awarded by the Scientific Council of Saint-Petersburg Society of Naturalists for outstanding achievement in modern evolutionary biology of development and comparative zoology. A regular visitor to FHL, he was an instructor for Comparative Invertebrate Embryology at FHL in 2001 and was at FHL in January, 2010 working on brachiopod development..

Editor's Note: A. Kowalevsky (1840-1901), realized that *ascidians* had a *chordate tadpole larva*, and so belonged to *chordates*, rather than *mollusks.*

UW Names Lisa Graumlich First Dean of College of the Environment

A scientist known internationally for research on climate and ecosystems — and who has a track record of getting wide-ranging groups of experts to focus on environmental issues —has been named the inaugural dean of the UW's College of the Environment, now in its first academic year. Graumlich has been director of the University of Arizona's School of Natural Resources and the Environment since 2007.

Graumlich will lead a college with 1,400 students, 11 core units and 185 faculty members. That's more faculty than the environmental schools at Duke, Michigan and Yale combined. Establishment of the new college was approved by the UW Regents in June 2008, courses were offered under the new college for the first time last fall. Units of the college are focused on areas such as natural resources, climate, Earth sciences, oceanography and sustainability. They received more than $74 million in grants and funding and more than $20 million in private support in fiscal year 2009.

"The power of the College of the Environment is our research muscle and interdisciplinary rigor, combined with our commitment to developing the leaders of tomorrow," said UW Provost Phyllis Wise, who led efforts to create the new college. "We provide some of the best thinking and research on the complex environmental challenges of the day— and never has there been a more critically important time to have our best minds focused on those challenges."

Friday Harbor Labs Joins College of the Environment

Friday Harbor Labs is the unit most recently scheduled to join the new College of the Environment. The laboratories and Washington Sea Grant became part of the college July 1, 2010. Units already in the college are the Department of Atmospheric Sciences, School of Aquatic and Fishery Sciences, Department of Earth and Space Sciences, School of Forest Resources, Joint Institute for the Study of the Atmosphere and Ocean, School of Marine Affairs, School of Oceanography, Program on the Environment and Washington NASA Space Grant consortium.

"The college is a great resource for the entire state," said Dennis Hartmann, interim dean and professor of atmospheric sciences. "We produce and house many of the top experts knowledgeable about natural resource and natural hazard issues in Washington, extending from the forests, plains and streams of Eastern Washington to the geological activity beneath the ocean near our Pacific shore."

Bio/Computational Evolution in Action Consortium (BEACON)

BEACON is a recently funded NSF Center to study "Evolution in Action" that will bring grant dollars to FHL activities. Beacon is based at Michigan State University, with participating faculty at the University of Washington, North Carolina A&T State University, the University of Idaho, and the University of Texas at Austin. Dr. Billie J. Swalla, a UW Department of Biology Professor who does research at FHL is one of the consortium members and FHL is a key component of the Research and Educational Components of the grant. The grant is funded to foster interactions between computer scientists, engineers and evolutionary biologists to solve contemporary problems. For instance, computer algorithms from evolutionary biology might even be used to predict where cars will crumple during accidents. Designs can then be implemented that ensure the crumpling outside of the passenger seats. Look for upcoming BEACON funded courses at FHL, such as Computational Genomics, taught by Dr. Swalla and other BEACON faculty.

President-Elect of Society for Integrative & Comparative Biology

Professor Billie Swalla has just been selected as President-Elect of Society for Integrative & Comparative Biology! This prestigious Society has approximately 2,400 members whose interests range from cellular and molecular biology to population biology/ecology to systematics and evolutionary biology. It was founded in 1902 as the American Society of Zoologist, and change it's name in 1996 to reflect the scientific breadth, integrative approaches, and interests of its membership across all disciplines of biology.

Billie is maintaining a long Departmental tradition of Departmental faculty serving as President of SICB. In fact, here's a list of Presidents coming from Zoology/Biology since 1976:

Aubrey Gorbman, Donald S. Farner, Lynn Riddiford, Alan Kohn, John Wingfield, Ken Sebens, and Billie Swalla

FHL's K-12 Program Winter Studies

Jenny Roberts

Photo by Jenny Roberts

Watersheds & Salmon Release

In preparation for releasing their juvenile salmon, fourth grade students from Friday Harbor Elementary School were introduced to the importance of watersheds and what makes a healthy watershed. Through a lab observing goldfish subjected to different water temperatures, students learned how temperature affects fish's metabolic rate and dissolved oxygen (DO) levels in water. Students released their salmon into False Bay Creek after DO, pH and temperature measurements indicated conditions were favorable to salmon health.

Photo by Jenny Roberts

Photo by Jenny Roberts

Gray Whale Project

Friday Harbor Middle School seventh graders participated in the San Juan Island Whale Museum's Gray Whale Project to enhance their study of the human body. After successfully assembling the gray whale skeleton students discussed the function of the skeleton and the probable cause of death of this gray whale.

Cell Diversity Demo

Friday Harbor Elementary School fifth graders had the opportunity to view six different cell types via the video microscope to get a glimpse of how diverse cells can be in form and function from single cell protist to an urchin egg.

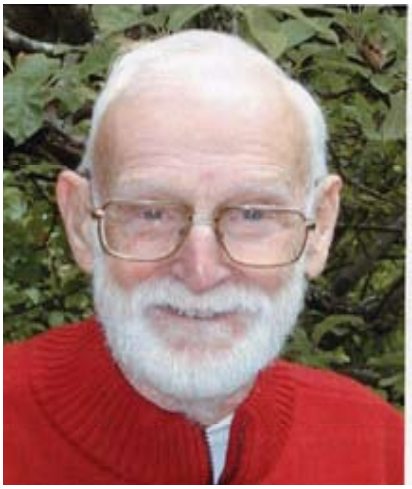
Photo by Jenny Roberts

Editor's Note: You can help the Friday Harbor K-12 children's science education by contributing an amount of any size, large or small, to the FHL Science Outreach Program. Call Rachel Anderson at 360-378-2165, ext. 2.

Return to TOC

Celebration of the life of Dr. Fred E. Ellis 1916 - 2010

Trish Morse, March 27, 2010



Fred began his conservation work in the San Juans when he purchased property on Shaw Island in 1937. Over the course of the years, he and his wife, Marilyn, purchased nearly 1,000 acres of wetlands, agricultural fields, forests with old-growth remnants and undisturbed shoreline. Over the years, Fred and Marilyn donated land to the University of Washington to be managed and used by the Friday Harbor Laboratories on San Juan Island for education and research. Fred died in his home on Shaw Island on February 8, 2010 at age 93, ten years after Marilyn's death. A memorial was held at the FHL to celebrate Fred's wonderful achievements in land conservation and preservation. These are notes taken by Trish Morse during this memorial.

"We all met at the FHL dining hall, but of course the ferry from Shaw was a bit late. There were lots of people there. Dennis Willows was the Master of Ceremonies. He gave a heartfelt talk on his long friendship with Fred and the leadership Fred had provided for developing his thinking about conservation. He noted the difficulty of taking land from the tax roles and convincing a university of accepting responsibility for land – but when Fred appeared, it became clear that the influence, tenacity, skills, and determination of this scholar to save the land would overcome any hesitations.

Roger Deroos spoke on Fred being so much an important part of the original Board of the San Juan Preservation Trust. He was followed by Stephanie Buffum who spoke about her deeply felt closeness to this iconic leader as a personal friend and member of the Friends of San Juan.

Dennis then introduced Connie Kravas, vice president for development and alumni relations at the University of Washington. Connie held up the letter that President Emmert had sent and declared she would not read it. She instead wished to relate stories about Fred - her personal interactions with him. It happened the day the University of Washington brought the sign "Frederick and Marilyn Biological Preserve" to Fred's home. It was about how Fred wanted her to come early so he could talk with her, of her taking the wrong ferry and being sort of stuck in Anacortes and Fred on the telephone saying, not to worry - you will get here in time, and she did. It was a wonderful story, and while it was nice the letter was there, she had found the much better way to celebrate this friend.

Ken Sebens was introduced next and he spoke of the education and research opportunities that are already enabled by the marine habitat and the protected preserve forest. Ken recognized that the baton for being the steward of the preserve had been passed by Dennis to him and that was a role he was eager to accept. He spoke of having Fred Jr., Maintenance Supervisor, at the labs and the prestigious award he and his crew had just won from the University, and how Fred and his crew were up-keeping up the Cedar Rock beach house and other buildings on the preserve. Again, you could sense the personal commitment, something that resonated very well with all there.

Then Dennis introduced me. I spoke as a mouthpiece of three members of the FHL Advancement Board (Don Peek, Jan and Robbie MacFarlane) who wanted so much to be there to represent the Board and celebrate their friendship with Fred. I told stories from the emails they sent. Then I spoke from my association, noting that the time I visited in 2002 I was on crutches, and he and I chatted at the house. When I began the conversation, I thought I was a liberal - but soon realized I was somewhere off in the middle - (that did draw a laugh).

There were remembrances from life-friends, Bob Wilson and Nancy Draper. Nancy drew tears from all our eyes as she spoke of Fred's lifetime influence with her son, of Fred's traveling down to Seattle as her son lay dying in a hospital, and his wife Marilyn making gowns of all colors mimicking the hospital stuff - we were all a bit teary as was she.

Then Fred Jr. spoke. Fred wore a leather jacket that was from some very early part of Fred Sr.'s life. He also told stories - funny ones - but cried as he told them. Then Fred read several poems, then rang eight "all is well" bells using the very beautiful bell that they had brought over from Fred's house. That was followed by a 10-minute video Fred's son made of his grandfather's life. Several others, mostly family, added some thoughts, often about the long boat trips during which they were transformed into preservationists and inspired to save the world. All and all it was an amazing and heartfelt group who were very much family and the ceremony was very well done. I noted on a group of pictures that Bill Calvin and I had taken of Fred, "Thanks Fred, you and the Preserve will always be a part of the Friday Harbor Laboratories."

Return to TOC

Jazz at the Labs

The 10th annual music fest, Jazz at the Labs, rocked the roof off of FHL's commons on June 19th. Dick Stein, KPLU's Midday Jazz host and NPR News and All That Jazz, was MC of the event.

San Juan Jazz Quintet
Photo by Trish Morse

Jazz Coalition
Photo by Trish Morse

The San Juan Jazz Quintet warmed up the crowd with their rich renditions of jazz classics during dinner. The Quintet, which is booked one Saturday each month at Friday Harbor's Pepermill Restaurant, has Rich Barker playing Saxaphone and Flute, Thor Hanson on Bass, Jonathan Piff on Guitar, Rob Simpson on Keyboard, Dennis Willows playing the Drums and Jill Urbach is the Vocalist.

The Jazz Coalition, led by Chris Amemiya, took the stage after dinner playing a combination of contemporary compositions and many of the best loved jazz numbers. Their improvisations were original, fresh, adventurous and technically challenging. Each of the Coalition's musicians is known for his/her individual accomplishments in the jazz field and their musical conversations with each other in the Coalitian are too good to describe. The members are Chris Amemiya on Trombone, Jay Thomas on Trumpet, Flugelhorn and Saxophone, Dawn Clement on Keyboard, Mark Taylor on Saxophone, Chuck Kistler on Bass, and Greg Willamson playing Drums

All proceeds from Jazz at the Labs go to support FHL's K-12 Science Outreach Program which brings exciting, inquiry-based and relevant science and environmental education into local classrooms. This is a partnership among the Labs, San Juan Island School District and Spring Street International School. Students of the FHL Science Outreach Program will be uniquely qualified to be the future stewards of our marine and freshwater environment.

If you want to contribute to FHL's K-12 Science Outreach program, call Rachel Anderson at 360-378-2165, ext. 2. A small contribution will make a difference and will directly benefit the San Juan Islands' school programs.

Return to TOC

The Helen Riaboff Whiteley Center's 10th Anniversary Celebration

Bill Calvin, Ph.D.

I spent a month of 1997 at the Rockefeller Foundation's Villa Serbelloni in Bellagio, Italy, the world's most famous study center for scholars and artists. On my return, I was overjoyed to hear of Arthur's plans for providing FHL with such a place. The Whiteley Center fills a need that is difficult to define but, when an excellent solution to that need appears, it is instantly appreciated even by former opponents.

Many will understand the need for a group retreat but have little insight into the need of the creative person to get away from everyday interruptions to have a long, intense month of

pulling things together. But Arthur saw the need for such a creative space—and created one with a distinct Pacific Northwest flavor, quite different from Bellagio with its Old World ostentation stretching back two thousand years, of grand estates facing the water to see and be seen. Here we have no corps of cooks and gardeners like Bellagio (think resort hotel, improbably run by intellectuals) but rather the best of Pacific Northwest architecture nestled into the forest, hard to spot from the ferry but with the scholars afforded pocket views of nature and passing boats.

Arthur Whiteley's Thoughts on the Center's 10th Anniversary

The delight for me about the Center is the incredible diversity of scholarship displayed by the 2000 plus users in the first 10 years. I have listed a few below, chosen to show this diversity. Books, papers, planning sessions and symposia – creativity without boundaries. And don't forget – there are still papers, poems, plans and books from 2000 others to cite, and many more years for more to come.

Bruce Balick (UW) and colleagues – Where in the cosmos did carbon come from?

Steve Vogel, (Duke) - the first text on *Comparative Biomechanics.*

Bill Calvin (UW) several books, including the prize winning *A Brain for All Seasons*

Rod Dresser (Carmel) two workshops on nature photography

Michael Honey (UW) – a mammoth book on M. L. King and civil rights - *Going Down Jericho Road*

Richard Kenny (UW) – a wonderful book of his poetry – *The One-Strand River*

Nalini Nadkarni (Evergreen) – books on ecology of tree canopies, including *Between Earth and Sky*

Don Rogers (Long Island U) - many mathematical papers plus the book *Heats of Hydrogenation*

Alvin Kwiram (UW) and 30 others – an international sysmposium on Molecular Photonics

Roger Morris (formerly in the National Security Council) – a new book for his impressive listing – *Kindred Rivals, a Comparative Study of the Inner Politics of Ameerica and Russia Since 1917*

Charles Murray and several others (UW) – planning research for Center of Cardiovascular Biology

Brad and Mark Leithauser (Johns Hopkins and the National Museum of Art) several delightful, illustrated books of light verse including *Toad to a Nightingale*

Woody Sullivan and John Baross (UW) the first text on *Astrobiology: Planets and Life*

Joram Piatigorsky (NIH, Eye Institute) – a novel in progress to be focused on scientific research, tentatively titled *Jellyfish*

Gillian Mackie (U Victoria) – a detailed treatise on *Early Christian Chapels in the West*

David Montgomery (UW) – a fascinating book showing how soils have significance – *Dirt. The Erosion of Civilization*

Ben Hall, Arthur and Tom Cable
Photo by Kathleen Ballard

Photo by Kathleen Ballard

Arthur, Liz Ilg and Richard Norris
Photo by Kathleen Ballard

Highlighting: Dr. Steve Wainwright

The Stephen and Ruth Wainwright Fellowship Endowment, established in 2001, provides financial assistance to graduate students studying or conducting original research in functional morphology at Friday Harbor Laboratories.

Trish Morse Resident Scientist FHL

The year is 1979. My summer was about to begin. I had just returned from a Fulbright year in Fiji at the University of the South Pacific, and I was thrilled to know that I had won the lottery with my acceptance letter, and would spend my summer at FHL. I stood in the lunch line, and suddenly heard this young man behind me talking about Fiji! Needless to say, I turned and we quickly engaged in remembering all the wonderful spots on the tropical island! We sat to eat, and I was having great difficulty figuring out how old this young person was. He had told me his name was Peter Wainwright, and I guess that last name was suppose to mean something – but it did not. Later he admitted he was a high school kid, who had accompanied his dad, a Professor at Duke, and a gang of graduate students to Fiji; That was my introduction and the beginning of a life long friendship with the SON of the "known to everyone else" Steve Wainwright. And, I very SOON knew who Steve Wainwright was!!

Three Generations: Steve, son, Peter, and grandson Dylan
Photo by Trish Morse

Fast forward, this summer (2010), now Professor Peter's son, Dylan, an undergraduate student at Duke, has been accepted to the Fish Course at Friday Harbor!

So much is in between these bookends. Much of the scientific legacy of Steve Wainwright is captured in the students and colleagues here at FHL, and the legacy pictures are drawn by some of those folks below.

And he truly believes in giving back by sharing his enduring wisdom as a member of the FHL Advancement Board, and through the endowment which supports the research and education of the next generations of FHL graduate students.

Rachel Merz, Professor of Biology at Swarthmore College

Being a member of the first Biomechanics class at Friday Harbor Labs was one of the most important experiences in shaping my understanding of science and the multidimensional roles that mentors play. The two Steves (Wainwright and Vogel) and Mimi Koehl put on an incredibly stimulating, intellectually rich course that used the resources of Friday Harbor to give all of us a sense that there was a whole world ripe for biomechanical investigation.

It was also eye opening to see the Wainwright academic family in action – the creativity, rigor, energy and accomplishments of Mimi Koehl, Mark Denny, Mike LaBarbera and John Gosline were completely inspiring. And one of the most amazing things to me at that time was the effort that Steve made to know each of us individually. Over the duration of the term he took us in small groups of two or three out to dinner with him alone.

In total, he provided a setting that invited each of us to enter the world of Biomechanics and enter we did! Of the thirteen students in our class, nine went on to do dissertation projects that were inspired by our summer with him.

This photo is a copy of a slide made on what was perhaps the first day of the class – we were using the green dye fluorescein to mark water currents. Left to right – Kraig Derstler, Scott Lidgard, Sarah Armstrong, Barb Best (plaid shirt), Tom Daniel, Steve Wainwright, Mark Patterson, Richard Emlet and Mark Denny.

Mark Denny – Professor of Biology, Stanford University – Hopkins Marine Station

Summer 1979 during first Biomechanics course at FHL. Skinny Steve was always cold.
Photo by Mimi Koehl

Steve Wainwright rescued me from Nepal. After I graduated from college, I was all signed up with the Peace Corps and, strange as it may seem, they had decided to send me to Nepal to teach people how to fish. Two months of language training and then, other side of the mountain, buddy, see you in two years. But I had taken Steve's biomechanics course in my last undergraduate semester, and Steve saw something in the way I thought. He decided that by joining the Peace Corps I was going to "drop out of science," and he came up with an alternative. He offered to pay me a minimal salary if I would come work in his lab, doing whatever research I wanted to do. Here was an offer I couldn't turn down. I ended up playing with spider silk for a year, which greased my way into grad school, and I've been a biomechanic ever since. Never been to Nepal, mind you, but I've never regretted it. The breadth of intellectual experiences I've had because of Steve far exceed those of any Shangri-La.

Alan Kohn Professor of Biology, Emeritus – University of Washington

Steve Wainwright and I washed up on the shores of Hawaii within a few months of each other about 55 years ago, as visiting graduate students at the University of Hawaii. We also both met our wives-to-be there. My memory is a bit hazy, but as I recall, Steve and Ruth more or less eloped. Marian and I had a real wedding, and Steve was the best man. I really didn't think too much about this afterward, until he and I were the two candidates who ran for president of the then American Society of Zoologists for 1988. For this occasion I sent Steve a card inscribed, "May the best man win." He did.

At Duke, two Steves created the sub-discipline that I sometimes call biological biomechanics, not least with the courses they taught at FHL and the disciples they brought there. I don't pretend to be a biomechanic, but I learned from Steves W. and V(ogel). to appreciate how essential its study is to understanding how marine animals make their livings in their world. And I found the most successful way to convey this knowledge and appreciation to students in my invertebrate biology courses was through Steve W.'s great little book, *Axis and Circumference.* And that and his big book helped me to mentor my only biomechanical Ph.D. student, Terrie Williams, who came from Duke and Steve. Terrie convincingly demonstrated the importance of how profoundly the viscosity-inertia relationships of active animals change during their developmental stages.

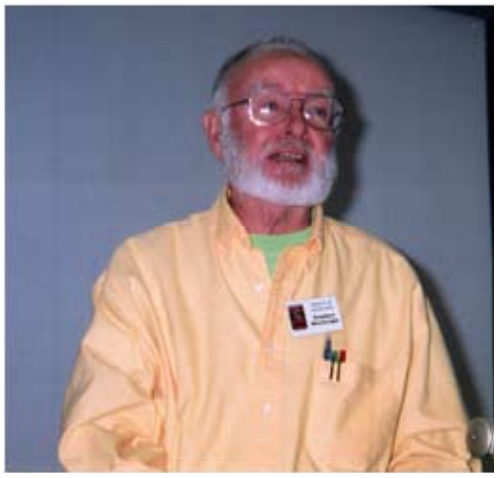
Steve Wainwright made sure that students took advantage of the FHL facilities and biota as well as the intellectual environment, and through his continued support he ensures that future students will also have these great opportunities.

Mimi Koehl, Professor, Integrative Biology, University of California, Berkeley

Steve Wainwright was my major professor when I was a Ph.D. student at Duke. He worked very hard with his students to get us to see the big picture into which our research fit, and to steer us towards choosing research organisms and questions that were well-suited to answering significant questions. One way he did this was by using the dreaded "crystal ball question". Whenever I would tell him about a new research idea I'd had, or a new experiment I wanted to do, he would say: "So What?! If I had a crystal ball and told you the answer to that, what would you know? Why should we care?"
…I'd wander off and think about it, and then go back to Steve and tell him what the bigger question was that I could address with this result. Then he would again say: "So What?! If I had a crystal ball and told you the answer to that, what would you know? Why should we care?" … and so on, and so on… We hated it, but boy, was it good for us!

Mimi Koehl and Steve Wainwright
Photo by Trish Morse

Steve Vogel, James B. Duke Professor of Biology, Emeritus, and Research Professor, Duke University



Steve at FHL's 100th Celebration
Photo by Trish Morse

Steve arrived at Duke as a faculty member two years before me, and for my first years we were both heavily invested in a troubled interdepartmental introductory biology course. Steve thus fell into the role as chief mentor for teaching for a very raw 26-year old who needed a lot of mentoring. So much of my sense of how to teach effectively was developed under his watchful eye and with his percipient advice. At that time we had less interaction in our own fields— his interests centered on solids and his approach was that of morphology; my interests centered on fluids, and I was basically a physiologist. But somehow I became involved with his students, serving on most of their Ph.D. committees even before, in the late '70s, we figured out that we were both doing biomechanics.

What I saw still strikes me as quite remarkable and all too rare. Steve had the peculiar ability, generally through an initial tutorial, to look into the heads of new students and figure out better than they themselves knew just what kind of work with what kind of approaches would make best use of their talents. I have never figured out how he did it, but the results speak for themselves--quite literally. His students were never apprentices on his projects, and they never generated echoes of his particular work. Rather they took off, each on a separate and usually productive trajectory. The diversity of the doctoral projects that came out of his lab in the '70s, '80's, and '90s is exceeded only by the diversity of projects his now former students have carried out since.

He was never a spectacular lecturer, he was not a greatly gifted writer, and his own record of research publications is not especially extensive. But what a legacy his students constitute! I watched it happen, and I assure you that both a lot of effort and some special magic underlies the result. He was the ultimate research catalyst, quite beyond any one else with whom I've interacted.

Philip J. Motta, Professor, University of South Florida

As an undergraduate, Steve Wainwright had a huge impact on my early career. Steve would spend inordinate amounts of time patiently coaching undergraduate students like me through their class and research papers. He brightened up the classroom with the most outlandish shirts and bow ties, sponsored European scholars as guests in his classes, and even bought invertebrate biology textbooks for the entire class. His enthusiasm for biomechanics was contagious, so much so that an entire generation of functional biologists radiated from his lab at Duke University. Today, his legacy continues through a generation of scholars.

Steve and Charlotte Wainwright June 2010
Photo by Trish Morse

Tom Daniel, Joan and Richard Komen Endowed Chair of Biology, University of Washington.

At Duke, Steve was an avid supporter of graduate education in all dimensions -- from his establishment of the Cocos Fellowships to his personally funded jaunts with students to a breathtaking range habitats where they would study and equally breathtaking range of organisms, to his weekly one-on-one tutorials with students, to his unending dedication to their professional development. Few can boast the success he has had.

At Friday Harbor, he was famous for bringing the best-of-the-best to the labs to provide the most exciting educational environments and to create a charette-type atmosphere among students and faculty. One additional thing. Science, students and art are the three words that come to mind when we think of Steve Wainwright. The former two are clearly present in his history with UW and Duke. The latter has been a major part of ingredients of Steve, and is a big part of his life right now.

I am reminded, however, of one unfortunate incident. He had purchased a massive white soft sculpture of a fern -- muslin fabric formed into hands and arms that mimicked the unfurling fronds of fern fiddleheads nearly three feet in diameter. Some graduate student had the misfortune of spilling an entire cup of coffee on it. "you poor maggot" said Steve ---

Editor's Note: Steve Wainwright is Emeritus J.B.Duke Professor of Zoology at Duke University. He mentored 36 graduate students, many of whom studied at FHL where Steve co-taught biomechanics in the summer of 1974 with Mimi Koehl and Steve Vogel. He founded comparative biomechanics in North America with Steve Vogel. Since 1990 he funded Bio-Design Studio at Duke and in Durham, the Nekton Research LLC and nonprofit Center for Inquiry-Based Learning. He now defines himself as a wood sculptor. His SeeSaw Studio instructs teens on art and marketing after school. He served on FHL's Advancement Board for many years. Steve and Charlotte Wainwright both are registered at FHL's Whiteley Center this 2010 summer working on science and art.

John Gosline, Professor of Zoology, Emeritus – University of British Columbia
Emily Carrington, Associate Professor of Biology – University of Washington

We have many fond memories of interactions with Steve, but one of our very favorites happened just yesterday, when Steve lectured to the 2010 FHL Biomechanics class. Starting with a simple concept, in this case growth increments, and leading students to develop new insights into how organisms work and respond to their complex environments. It was exciting stuff. Steve fed off the students' responses and we could all see clearly the classic Wainwright spark: a full body jiggle and a great big "WA!" The picture of the "mechanical test" shown here documents one of the key experiments in Koehl & Wainwright (1977) "Mechanical adaptations of a giant kelp". It illustrates the style that Steve taught his graduate students, an approach that we and his many academic progeny attempt to emulate, but can never duplicate. It is an honor to be able to continue the great tradition of Biomechanics at FHL that Steve pioneered.

Steve measures the tensile properties of a *Nereocystis luetkeana stipe* with John Gosline and Mimi Koehl, circa 1975

You can participate in honoring Steve Wainwright by clicking on this link, https://secure.gifts.washington.edu/uw_foundation/gift.asp?source, entering Wainwright as a search word, and by contributing any amount, small or large, to the Fellowship Endowment or other FHL student support fund. Student financial support is critical during this difficult economic time. Your generosity will be greatly appreciated.

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.

2004 class in Marine Invertebrate Zoology

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 Emeritus of Biology 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, click on this link. https://secure.gifts.washington.edu/uw_foundation/gift.asp?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@uw.edu or Rachel Anderson in the Development Office rachelea@uw.edu , 206-616-0760 or 360-378-2165.

Scholarship / Fellowship Funds

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

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

Karel F. Liem Endowment:
Supports research on fishes

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 support students at FHL

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

Brooks and Suzanne Ragen Endowed Scholarship
Scholarships to graduate and undergraduate students for study in the 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 Northeast Pacific

Keneth Sebens Student Endowment:
A current use fund to support students at FHL

Richard and Megumi Strathmannn 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 FHL directors with discretionary funds for unbudgeted needs including student assistance

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FHL Contact Information

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Local Calls from San Juan County, WA	360-378-2165
Fax:	206-543-1273

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Friday Harbor, WA 98250 USA

Kenneth P. Sebens, Director

Adam Summers, Resident Associate Director

Visit the FHL web site *http://depts.washington.edu/fhl/stafflist.html* and click on People in the left side menu for listings of FHL staff, resident scientists and advisory board members.

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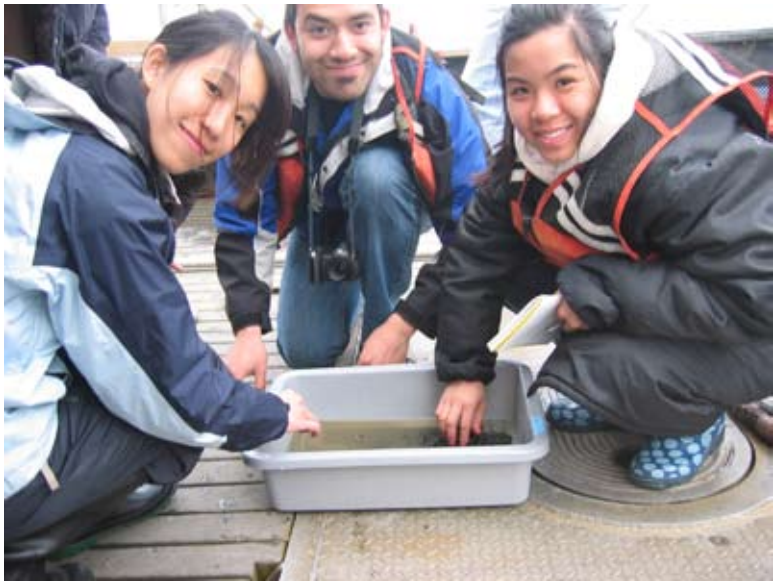

Research Apprentices
Photo by Andrea Ogston