

Intertidal Tidings

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Research apprentices look over specimens trawled up from 40 fathoms.

tems design and silicon fabrication. Their work also included observation of *Tritonia* in its natural habitat and an opportunity to develop different aspects of the design and implanting of the microcomputer. Each student prepared a paper on their process and a National Science Foundation graduate fellowship application based on their project. There were some noteworthy accomplishments:

- A pair of students showed that the anesthetic used to permit the implant surgery produces no long-term effects on the brain.
- A student developed a protocol for testing newly developed microelectrodes that have been etched onto a silicon chip.
- Another pair of students developed the tools for microscopic handling of the microchips along with their actual placement on the brain, and a method for applying surgical adhesive to stabilize the chip.

The research conducted by this team of undergraduate research apprentices is ongoing, thanks to a \$1 million grant from the Packard Foundation. Dennis Willows, professor of Zoology and Director of Friday Harbor Laboratories, is justifiably proud of the progress so far, and he's been studying the brain of *Tritonia* for over 3 decades. "It was a terrific team," he says. "The people brought exceptional diversity. This team concept has the potential for catalytic discovery like virtually nothing I've ever experienced in my academic career." ■

Research Apprenticeships

Students register for it, but it's not a course. They get credit for it, but it's not a course in the conventional manner. In fact, the undergraduate research apprenticeship program at Friday Harbor Laboratories is a totally different experience. Instead of a quarter of classroom lab and field training the undergraduate research apprentices at Friday Harbor Laboratories are immersed, hands-on, in field and laboratory research in topics that range from evolution to marine resource management.

Initiated in the spring of 1999, the FHL program provides substantive research opportunities for students during the academic year, while most field stations can only offer research experiences for undergraduates during the summer months. Each apprenticeship involves five to eight students working closely with faculty and graduate students on a series of research problems around a selected theme.

Implantable Computers and a Research Apprenticeship Team

In the spring of 2001, a team of faculty and students worked together to begin integrating computer electronics with neurobiology. Neurobiologists examine the activities of brain cells and neuronal networks to decide, remember, modulate and control an animal's every sensation, thought, movement and act. The research apprenticeship team proposed implanting a stand-alone microcomputer into the brain of a marine mollusk *Tritonia diomedea* (Sea Slug), to allow multi-site intracellular recording in a live, freely behaving animal. Their goal is to better understand the networks that decide neuronal signaling, behavior and control and environmental stimuli.

Students in the program had intensive immersion in invertebrate neurobiology, microelectromechanical sys-



Studying trawled specimens in the FHL lab.

What They Think ...

Since the FHL Research Apprenticeship program began in Spring 1999, more than 100 students have participated. When asked in a recent survey, 89% of former Research Apprentices rated the FHL program as excellent and 8% said it was very good. The value of the apprenticeship experience to their academic and/or professional career was rated excellent by 83% of the survey respondents; 14% rated it as very good.

Here are just a few of the student comments we received:

"These apprenticeship courses are fantastic. They allow the student to actually participate in scientific research and show us the way to learn more than we had thought possible in one quarter."

"I consider my experience at FHL to be the most valuable of my academic career."

"The FHL apprenticeship gave me the opportunity to spread my wings and to feel what it was like to be responsible for an original research project. We as students worked nearby and among top scientists, and benefited from their help. Through it I gained a lot of confidence..."

"I went to sleep every night exhausted and woke up every morning eager to learn more!" ■



David Duggins hauling in the trawling net on the R.V. Nugget.

David Duggins; Distinguished Staff Award Recipient

Each year, the University of Washington presents the Distinguished Staff Award to only 5 University staff members who have made outstanding contributions. One of the 2001 awardees was Dr. David Duggins of Friday Harbor Laboratories.

David has been at Friday Harbor Laboratories for 21 years where he is a Marine Technologist. In a small department with limited resources, he handles numerous responsibilities, including skipper of the Research Vessel "Nugget," diving safety officer, chemical and radiation safety officer, local marine historian and consultant to scientists and students on selection of study sites and other scientific tasks. On his own volition and with no University support, Duggins began an outreach program for K-12 students in San Juan County schools, including building a salt-water aquarium for an elementary school. He was able to secure a \$100,000 award from a private foundation to purchase a remote-operated vehicle that transmits video images from depths up to 1000 feet.

Dennis Willows, FHL Director said of David Duggins "His vast commitment of time, his direct and generous

In 2001, FHL provided financial support to 97 students through scholarships, fellowships, and support to Research Apprentices. The following students were among those who received fellowships from FHL:

Stephen & Ruth Wainwright Endowed Fellowship Fund

Marney Pratt

Alan J. Kohn Endowed Fellowship Fund

Jennifer Burnaford
Jonathan Cowart
Andreas Heyland
Justin Lambert

Anne Hof Blinks Fellowships Fund

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support to the educational and research efforts of university people, and his major success in seeking and finding funds to assist the University achieve its educational and research goals are extraordinary."

David Duggins is the second FHL staff member to receive this award, joining Dr. Craig Staude who received the award in 1997. ■

FHL Courses for 2002

SPRING QUARTER

April 1 to June 8, 2002

Marine Botany / Marine Zoology - Megan Dethier & Jeffrey Hughey

Undergraduate Research Apprenticeships:

Modulation of Small Neural Circuits - Katherine Graubard & Andrew Christie

Ecosystem Analysis for Preserve Management & Planning - Roxanne Hamilton

Cell Biology of Morphogenesis & Development - Garry Odell & Dina Mandoli

SUMMER QUARTER A

June 10 to July 13, 2002

Marine Invertebrate Zoology - Mike Hart & Bruno Pernet

Comparative Invertebrate Embryology - Billie Swalla & George von Dassow

Fish Swimming: Kinematics, Ecomorphology, Behavior & Environmental Physiology - Paolo Dominici, Guy Claireaux & John Steffensen

SUMMER QUARTER B

July 15 to August 17, 2002

Larval Biology - Danny Grunbaum, Richard Strathmann, & Craig Young

Paleobiology: Invertebrate Taphonomy - Mike LaBarbera, Michal Kowalewski

Marine Algae: Seaweeds & Phytoplankton - Charlie O'Kelly & Paul Gabrielson

AUTUMN QUARTER

September 30 to December 14, 2002

East/West Program in Marine Science

Undergraduate Research Apprenticeships:

The Geophysics, Geochemistry & Microbiology of Marine Biopolymers - Pedro Verdugo

Marine Fish Ecology - Bruce Miller & Don Gunderson

Implantable Electrodes & Computers in Nervous System Processing - Tom Daniel & Dennis Willows



Larry R. McEdward, Ph.D.
1955 - 2001

Dr. Larry R. McEdward, who earned his doctorate at University of Washington in 1984, died unexpectedly on July 2nd. During his tragically shortened career, Dr. McEdward made fundamental contributions to our understanding of the evolution of development and life cycle patterns. Larry's contributions to larval development will have lasting effects on the field. Equally important were his contributions to his colleagues, students, friends and family here at Friday Harbor Laboratories.

Larry loved being at Friday Harbor Laboratories and on San Juan Island where, along with his research, he could pursue his passion for the outdoors. He particularly enjoyed kayaking and once wrote "I would rather be kayaking in northern Puget Sound. There is excellent paddling in the relatively protected waters of the San Juan Archipelago. Tidal currents can be extremely strong, but that is only a problem if you don't use the current atlas and end up paddling against the flow! The scenery isn't bad, if you can stand snowy peaks, coastal forests, and hundreds of rocky islands. Wildlife can be distracting too, with numerous eagles, otters, seals, minke whales, and Orcas." He will be missed greatly.

Contributions in Larry's memory can be made to The Marine Science Fund of Friday Harbor Laboratories. Larry received support from this fund when he was a graduate student at the University of Washington. ■

First Wainwright Fellowship Awarded

In 2000, the Stephen and Ruth Wainwright Fellowship Endowment was established to honor the Wainwrights and Steve's lifetime work in the field of functional morphology. Through the generosity of their friends and children Jennifer Caudle and Archie, Ian and Peter Wainwright, the endowment was created to support graduate students at FHL working in the broadly defined area of functional morphology.

The first recipient of the Wainwright Fellowship is Marney Pratt, currently pursuing a Ph.D. in Biology at Duke University. "I got the inspiration for my Ph.D. dissertation topic while taking the Marine Invertebrate Zoology course at FHL in 1998," said Marney. "Being the first Wainwright Fellow was especially meaningful to me as I am actually a product of Steve Wainwright's influence in the world of functional morphology."

The summer of 2001 brought Marney back to FHL to continue her research on how different forms of bryozoans are adapted evolutionarily to life in different kinds of water flow. The bryozoans are common marine colonial animals with a very great diversity of form and habitat.

"FHL docks have served as a convenient location to do field work because one side of the docks experiences significantly higher water velocities than the other" commented Marney. "Overall, my data so far support the idea that water velocity affects food capture, growth, and survival of bryozoans and this may limit certain species and certain forms to particular habitats; however many questions remain unanswered and I hope to continue my research at FHL next summer."

According to FHL Associate Director, Richard Strathmann, "I expect that Marney will discover and explain major ecological differences among differing forms of bryozoans and also trends in the evolution of colony forms." ■



Wainwright Fellow Marney Pratt collecting bryozoans from FHL docks for lab use.



Jazz Oracle swings at FHL.

Jazz Oracle at FHL

Led by saxophonist Ron Howell, who in his day job is president of Washington Research Foundation, Jazz Oracle 'brought the house down' at FHL when they performed here during the summer. Playing Jazz standards and putting their original edge on the music of Stan Turrentine, Miles Davis, John Coltrane, Herbie Hancock and other jazz musicians, Jazz Oracle showed why they are sought after regulars on the Seattle Jazz scene. Thanks to the tremendous response - more than 125 people attended, a sellout - Ron and Jazz Oracle have promised to return to FHL in 2002 to present another program of great jazz. ■

Raking In The Savings

For a lot of folks, autumn is the time for a lot of raking – all of those beautiful fallen leaves! Wouldn't it be nice if some of the raking involved raking in some tax savings and other financial benefits? Wouldn't it be even nicer if these personal benefits contributed to a 'pile' of future support for Friday Harbor Laboratories?

Not to carry the metaphor too far, but if you incorporate a charitable remainder trust or charitable gift annuity in your financial plans, all the following benefits are 'in the bag.' Both these gift options provide you with:

- lifetime income for you (or someone else you want to benefit)
- a charitable income tax deduction
- potential capital gains tax avoidance
- potential estate tax reduction

...and they will ensure your personal legacy in support of Friday Harbor Laboratories.

If you'd like to learn more about these life-income gift options, we have expert staff to help you. Call Bob Schwartzberg at 206/ 616-0760 or e-mail him at rsberg@u.washington.edu. ■

FHL Beach Walk

FHL research assistant, Sue Brady, describes two marine animals, *Nucella* (dog whelk snail) and the *Pisaster ochraceous* (purple sea star) at the annual FHL Beach Walk held at the Kanaka Bay home of Dr. Charles and Eleanor Nolan. Researchers and graduate students from FHL conducted a guided tour of the rocky intertidal and beach describing the abundant marine life. ■



photo: Les Arndt

Beach walk participants at Kanaka Bay.



photo: Les Arndt

Sue Brady shows local sea life.

Sea Star Society

At the recent meeting of the FHL Development Advisory Board, the Board approved the creation of the FHL Sea Star Society. Similar to a 'Dean's Club', the Sea Star Society is a program that recognizes donors who make annual gifts of \$1,000 or more to support endowments and funds at FHL.



Sea Star Society members will receive special benefits that recognize their high level of support. At the same time they will be enjoying the benefit of knowing they are making a difference in the lives of students who will be involved in research and study that will lead to the expansion of scientific knowledge and the enrichment of mankind.

For more information about the FHL Sea Star Society, contact Bob Schwartzberg at FHL. ■

Online Giving Supports FHL

Gifts to Friday Harbor Laboratories promote the education & training of new scientists through a very special experience at FHL.

To make a gift online, visit the FHL website at <http://depts.washington.edu/fhl> and click on Support FHL.

Your gift is tax deductible and will truly make a difference.

Email: fhlfac@u.washington.edu

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Donors Sustain and Build FHL Scholarships & Fellowships

Gifts are the mainstay of FHL scholarships and fellowships that enable students from all over the USA and abroad to come to FHL for research or classes. Here, students train with top-notch scientists, living and working in the company of other bright students and active researchers. The experience is intense and very special - the best that education can offer. Our donors have made this possible through continuing generosity over many years. If your name is missing from the list by our error, please let us know. Your help is important and appreciated.

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A current-use fund to provide student aid for next year's courses.

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Supports graduate students and post-docs for marine science studies.

Anne Hof Blinks Fellowship Endowment:

Supports students of diverse backgrounds in marine science studies.

Fernald Fellowship Endowment:

Supports graduate students for studies of marine invertebrate development.

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 through research or course work.

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.

Contributions to any of these funds promote the education and training of new scientists through a very special experience at FHL. A gift return envelope is enclosed.

FHL – A Unique Resource

One aspect of the privilege I've always felt about working and learning at FHL is the extraordinary range of people and interests one encounters in the course of visiting and working here. This experience is tangibly different from most academic departments and institutions, in that one can always find at FHL approachable world-class experts on diverse issues, and most of these special people are keen to share their expertise. These people (including many students) are passionate about marine organisms because of their relationships in populations, or their organs, cells, molecules, or how they work at any of these levels.

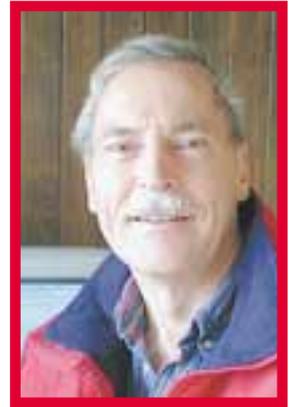
This ready access to passionate expertise is a powerful motivator for scholarly work and for discovery at FHL. But it is also a strong driver of science in the modern world generally because of the growing recognition of the value of **teamwork involving researchers with widely diverse backgrounds** and scholarly expertise. It is increasingly clear that encouraging people from fundamentally different scientific backgrounds to work together facilitates answers to very hard questions, and discovery of even more interesting and relevant questions.

In retrospect this is not surprising because **we don't know what we don't know**. We can be sure there are

lots of things we know nothing about, not even enough to frame a good (or even a bad) question. In this vastly important area of the unknown perhaps we stand a better chance to find important clues in rare environments like FHL. Here we are enticed by the surrounding rich biodiversity to look at organisms, mechanisms, and the linkages from molecules to organismal populations in the company of people who are similarly curious but who don't share our prejudices. Often, far more often than in more traditionally structured academic environments, this situation leads to discovery of fundamentally new knowledge.

Typically, there are people from over 50 institutions representing more than 15 countries at FHL annually. It is these people, their ideas and willingness, even enthusiasm, to share what they know and mix it up with others who are, initially at least, speaking a different scientific language, that make FHL a unique resource to the world of marine science.

—Dennis Willows



Editors: Bob Schwartzberg, Stacy Markman Art Director: Carol Maas Additional Photos: Stacy Studebaker



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