Intertidal Tidings

Newsletter for the Friday Harbor Laboratories • University of Washington • Autumn 2005 • Volume 10

Introducing Kenneth P. Sebens
Director, Friday Harbor Laboratories

Friday Harbor Laboratories welcomes Dr. Kenneth P. Sebens as the seventh Director in the 101-year history of FHL. Ken took over from Dennis Willows who, in September, 2005, stepped down after 33 years as Director.

Previously, Ken was Dean of the College of Science and Mathematics and Professor of Biology at the University of Massachusetts, Boston. He is married to Dr. Emily Carrington. Ken has two children, Charles (18) and Alison (21), both attending universities in Massachusetts (MIT, Wellesley). Emily's children, Courtney (8) and Stewart (11), moved with Ken and Emily to Friday Harbor.

Ken received his B.A. from the University of Connecticut in 1972 and his Ph.D. from the University of Washington in 1977. He studied with Bob Paine in the Zoology Department, and spent much of his time at FHL. From 1977-1985, he was Assistant and Associate Professor at Harvard University and Associate Curator at Harvard's Museum of Comparative Zoology. He became Professor at Northeastern University from 1985-1991. He was Director of Northeastern's Marine Science Center at Nahant, MA and of the East-West Marine Biology Program. The East-West Program taught fall courses at Friday Harbor Labs from 1990 to 2003. In 1991, he became Professor of Biology at the University of Maryland College Park, Professor in the UM Center for Environmental Science, and Director of the Marine Estuarine Environmental Sciences Graduate Program for the UM System.

Ken is a fellow of AAAS and was awarded a Fulbright Senior Scholarship in 1998. Over the past 27 years, he has published over 80 papers and book chapters on a wide variety of topics. His paper on indeterminate growth and optimal size in marine invertebrates, published in the journal "Ecology" in 1982, resulted in the Ecological Society of America's 1983 George Mercer Award for "outstanding ecological research published in the United States and Canada." Funding for Ken's research (since 1978) comprises over 33 awards, including continuous funding from the NSF (1979-2004). During the past five years, he has had two concurrent NSF awards and facilities support from the Smithsonian Institution. Ken has mentored 27 graduate students at three universities since 1978, several of whom now have careers as university faculty and research scientists.

Ken conducts research on benthic populations and communities in both temperate and tropical locations. One project is an investigation of community and population dynamics, and long-term change in rocky subtidal habitats in Massachusetts. This project has been funded by NSF since 1979, facilitating one of the most extensive long-term studies of coastal marine communities in the world, and will be continued in collaboration with researchers at Northeastern University. He will also initiate new research on the rocky subtidal communities of the San Juan Islands.

Ken has over 30 years experience as a diving scientist, including six missions living and working in the underwater laboratories "Hydrolab" and "Aquarius" located on Caribbean coral reefs. His research on coral ecology has focused on the diverse sources of nutrition for reef corals, and the influence of hydrodynamics on coral particle capture, nutrient uptake from seawater, calcification and growth rate (NSF, NOAA funding since 1985). These studies have taken him to many Caribbean reef locations including Jamaica, St. Croix, Belize, and Bermuda. He also spent a sabbatical year in Australia working on the Great Barrier Reef, while based in Townsville and Lizard Island.

At FHL, he feels his greatest challenge will be finding additional funds to maintain, and hopefully expand, the research and teaching opportunities for staff and students. The State of Washington has steadily reduced its percentage of support for the University; it is currently about 14% of the total budget. As director, he hopes to continue to find new funding sources as well as encourage researchers from related disciplines to use the Labs' facilities. He believes that the more interdisciplinary partnerships that can be formed, the greater the opportunity for new grants.

Ken's first experience at Friday Harbor Laboratories was in 1973 as a graduate student. During the 3 decades since he first came, Ken has been back many times and has always been a part of the Labs and the Labs have always been a part of his life. As he begins this next phase of his career, he brings a wealth of experience, educational success and ideas along with an understanding of the importance of FHL to marine science world wide.

Friday Harbor Laboratories looks forward to Dr. Kenneth P. Sebens' leadership as FHL moves forward into a second century of teaching, research and discovery in marine science.

Meet Emily Carrington ...

When Ken Sebens was offered the directorship of Friday Harbor Laboratories, it was with the enthusiastic support of his wife, Dr. Emily Carrington. Emily is a well known and highly regarded marine scientist and is, like Ken, a "Labbie"; a FHL alum.

Emily's interest in marine biology was launched while living in FHL's Dorm C back in the 1980's, when she was a summer student in the Biomechanics course. She went on to complete her B.A. at Cornell University, and her Ph.D. at Stanford University, where she worked with Dr. Mark Denny at Hopkins Marine Station.

Emily is no stranger to the Pacific Northwest, having spent three years in Vancouver as a post-doctoral researcher at the University of British Columbia. She comes to FHL from the University of Rhode Island, where she was on the faculty in the Department of Biological Sciences. Her current appointment is Associate Professor in the Department of Biology at the University of Washington.

Emily's research focuses on the mechanical design of organisms on rocky shores, habitats that are well known to be physically demanding yet biologically diverse. Applying the principles of engineering to seaweeds and invertebrates, she seeks to understand how the morphology and structure of an organism influences its ecological function. Her research involves both field and laboratory experiments; she is breathing new life into Lab 7 with the addition of new flumes and materials testing equipment.

Emily will be teaching the Marine Botany component of "Zoobots" at FHL each spring quarter. She will also teach on the Seattle campus each winter quarter and plans to develop a graduate course in marine biomechanics.

OVER 200 TOAST OUTGOING UW FH LABS DIRECTOR DENNIS WILLOWS

by Kelley Balcomb-Bartok (Reprinted with permission from the San Juan Journal.)

A crowd of over 200 people gathered on a sunny afternoon at the UW Friday Harbor Labs to celebrate the 33 year career of retiring director Dennis Willows. Willows, though retiring from his post as director, will stay on as faculty on campus. Following a short power-point presentation of photographs of Willows collected through the years, set to music — including some rare photos of Willows as a young child — several awards and personal statements were shared with Willows and the audience.

Willows was first presented an award by associate director Richard Strathmann on behalf of the faculty, students and staff. The crystal trophy, with a graphic of a parachutist at the top, reads: "Presented to Dennis Willows, in appreciation of 33 years of creatively conspiring to lead Friday Harbor Laboratories to greatness — happy landings — once again you've cheated death. Presented 9-14-05 by your friends, colleagues, students and co-conspirators."

Others shared their fond memories of Willows and their sincere thanks for all that Willows had done for them, the islands and the labs in general.

Laurie Spaulding, FHL's dietician, noting that Willows had not been presented with a gold watch for his decades of service, handed Willows a brightly decorated gift bag. Willows proceeded to pull out a gold ribbon with a gold alarm clock hanging from it, to the enjoyment and laughter of everyone present.

When Willows finally spoke — following over a dozen presentations by friends, colleagues, staff and students — there were tears welling up in his eyes. Willows expressed a heartfelt thanks for the outpouring of love and support and told those present that his job was the most unique and fulfilling job he's ever had, and that he couldn't have done it without all the wonderful, creative and supportive people he had worked with over the years. "I have been a cheerleader for the best team anybody could ever have asked for — thanks team."

People and Research at FHL ...

Illg Beach was the site and **Liz Illg and Janna Gingras** were the hostesses for the annual **FHL Beach Walk** in August**.** Over 55 people attended and were guided through the intertidal by **Trish Morse, Joann Otto, Terrie Klinger and FHL grad students and post docs**. This annual event is provided for friends, donors and other supporters of FHL.

Ron Howell and his band 'Chimera' and **Dennis Willows** and the 'San Juan Jazz Quartet + 1' entertained a sold out crowd at the **5th Annual Jazz at the Labs** fundraising dinner and evening of music in June. In its 5 years, "Jazz" has netted nearly $20,000 to support the FHL K-12 outreach programs on San Juan Island.

Elisa Maldonado, a graduate student at Scripps was named the first recipient of the **Larry McEdward Memorial Scholarship Fund at FHL**. Parents and friends of the late Dr. Larry McEdward established the fund. Elisa, the first member of her family to go to college said, "I am especially honored to be supported in Larry's name. I have read many of his papers on larval development which have been instrumental to the development of my research topic."

Kudos to FHL Development Advisory Board members: **Camille Uhlir,** on becoming the national president of ARCS (Achievement Rewards for College Scientists). ARCS provides scholarships to academically outstanding U.S. citizens studying to complete their degrees in science, medicine and engineering. **Robert (Bob) Lundeen,** for having an award named in his honor by the Orcas Island Medical Center Association (OIMCA) for his leadership and years of service to OIMCA. **Robert and Jan Macfarlane,** who provided for the building of an art studio that became part of the Whiteley Center at FHL. This year the **Macfarlane Art Studio** was well used as it attracted a number of artists to the Whiteley Center.

FHL Research Apprenticeship Program evaluations: At the end of each term, students anonymously evaluate this award-wining program. Overall, 92% of the students responding rated the program excellent or very good. As to the value to their careers, the program was rated by 94% of the students as excellent or very good.

In Memory: We have learned in the past year of the passing of three friends of FHL: **Molly Algren, Ph.D.,** was a researcher from Sitka, Alaska who came down to FHL often to catch up on research needs. Molly was volunteering as an EMT and was on her way by boat to help an injured Highway Patrol trainee when her boat hit an underwater rock. **Capt. Cleave Vandersluys,** worked at FHL between 1947 and 1983. Many at FHL depended upon his skills as a mariner and vessel operator for the success of their work. He owned and operated the MV Hydah to collect organisms that supported the research and classroom efforts of FHL people. Several FHL'ers served as deck hands on the Hydah, and learned from Cleave how to equip and operate a collecting vessel and where to find biological materials needed to make FHL run effectively and efficiently. **Patricia L. Dudley, Ph.D.,** earned her doctorate at the University of Washington in 1957. She regularly spent summers at Friday Harbor Laboratories, returning often to teach and continue her research in copepodology to which she was first introduced as a graduate student at FHL under **Paul Illg.** In 1994, Pat retired from Barnard College after 35 years as a Professor of Zoology, including terms as chairman of the Department of Biology. In her will, Pat left a generous bequest to Friday Harbor Laboratories to establish an endowment now known as the **Patricia L. Dudley Endowment Fund** for research scholarships for the study of systematics or the structure of marine organisms or for studies in marine invertebrate ecology. She directed that recipients of the fund spend a significant portion of their time at FHL.

Dr. Pedro Verdugo, Professor, Bioengineering & Internal Medicine at the University of Washington, is a resident scientist at FHL investigating carbon cycling in the ocean. His work at FHL is funded by the National Science Foundation and focuses on issues ranging from the dynamics of biopolymer networks inside the cell to the physical chemistry of marine biopolymer networks, their rules of association, their interaction with metal ions and bacteria, and ultimately their role in global carbon cycling in our planet.

Dr. Verdugo has also been teaching the Research Apprenticeship class on Biophysics of the Aquatic Gel Phase at FHL. The following is an outline explanation of the material being investigated and studied by his students here at Friday Harbor Laboratories:

At the moment, our planet is reaching an unbalance of about 3.5 billion metric tons a year between Carbon dioxide (CO_2) released and CO_2 recaptured from our atmosphere, and that could result in progressive increase in global temperature. In medical jargon, our planet is getting a fever and becoming increasingly hypercapnic.

The photosynthetic machinery of the ocean is responsible for about 50% of CO_2 withdrawal from the atmosphere. It is one of the two critical lungs of our planet. The National Science Foundation Biocomplexity Program, that supports our research, is based on the idea that understanding the cycling of carbon in the ocean is a prerequisite to developing objective and reliable models, methods, and policies to prevent the growing greenhouse effect currently affecting our planet.

Our interdisciplinary research program combines microbiology, polymer physics, and engineering theories and methods to understand: (1) the mechanisms of recapture of CO_2 by phytoplankton – the main photosynthetic reactor of the ocean, (2) to investigate the behavior of bacteria - that are the gas-guzzlers of the ocean, that metabolize marine organic molecules, thereby returning CO_2 to the atmosphere, and (3) to study the polymer physics and mass balance between marine organic molecules accessible to bacteria and those refractory to bacterial attack.

In our research we aim to develop robust mathematical models to predict the influence of these different processes on carbon cycling in the ocean.

What If ...

By Dennis Willows

1. What if **Joe Connell** hadn't served barnacle hors d'oeuvres to his scientific friends at an after-work party at FHL one summer day in 1960? It might have set back biomedical research on muscle for decades! This is because one of his guests from University College London, **Graham Hoyle** spotted that the barnacle muscle snacks were made up of the largest muscle cells in the animal kingdom — cells that he (and many others worldwide) have since used to learn how healthy muscles (including the human heart) work.

2. What if **Frank Johnson** hadn't noticed the green-blue glow of the jellyfish as they flashed in the wash of his oars late one summer eve at Friday Harbor Laboratories? Molecular biology and medicine today would have lost for decades or perhaps forever, the opportunity to use the gene for light-producing photoproteins for untold numbers of research and clinical applications.

3. What if **Ken Lohmann,** while at FHL, hadn't wondered if sea slugs detected the earth's magnetic field? Today, we wouldn't be on the threshold of understanding how animals sense the earth's magnetic field, the first new animal sense in over 100 years!

4. What if **Victoria Foe** hadn't brought her fruit flies to Friday Harbor Laboratories to figure out how they grow as tiny embryos? Today there would be no National Institutes of Health Center of Excellence at FHL (or perhaps anywhere) to combine powerful computer modeling methods, studies of embryos of diverse marine organisms, and the world's best imaging technologies to aim at deep problems of cell motion and division... problems like cancerous growth and birth defects.

5. What if a freshly graduated physicist, **Dennis Willows,** hadn't been offered an opportunity to learn about seashore life at Friday Harbor Laboratories in 1963? Odds are good he would never have discovered the largest brain cells in the animal kingdom (in sea slugs!) — neurons that have become a widely used model for studies of how brains work, and for efforts to build implantable computers that may someday repair damaged nervous systems.

6. What if **friends of Friday Harbor Laboratories** didn't make the contributions to support students and programs at FHL ... but they do and their continuing support will help more students and researchers achieve the success that has been the hallmark of FHL's first century.

The Helen Riaboff Whiteley Center at FHL

The Helen Riaboff Whiteley Center provides a refuge for established scholars and artists to study, write, create, and interact with collaborators in a peaceful and quiet environment. It is located at Friday Harbor Laboratories. Scholars can work in quiet isolation if they choose or can take advantage of opportunities to mingle with marine scientists or other Whiteley Center scholars.

The Whiteley Center is funded by the Helen R. Whiteley Foundation. The Foundation works with the University of Washington to provide a place for scholars as they carry out their creative work in the way the Friday Harbor campus served Helen Whiteley in her career. The Center is both a tribute to the faculty of the University of Washington and an encouragement for scholars of all disciplines and from all places to perform their work in this inspirational setting.

Recently, one such scholar, Dr. Margaret A. Brucia wrote the following note to Arthur Whiteley:

Dear Dr. Whiteley,

I am writing to thank you for creating a scholar's paradise. The time that I spent at the Whiteley Center was rewarding, productive and stimulating.

I am a professor and teacher of Latin who has been working for more than a year on a book for beginning Latin students about everyday life in Ancient Rome. Because of the pressing demands of my own everyday life, this project has been slow. I am pleased to report that I not only completed the last seven chapters at the Whiteley Center, but that I returned home refreshed and invigorated. The Whiteley Center more than surpassed my high expectations.

You and the Whiteley staff have created an ideal setting for scholarly work. The cottage (it seemed to me more like a cathedral in the woods) was a delight to come home to. The design offers just the right blend of nature, privacy, comfort and convenience. In fact, being in the cottage was so pleasant that I would have resisted leaving each morning were it not for my equally appealing study in the Center. I sat comfortably a my desk in front of the sliding glass doors that afforded fresh air and a breathtaking view of the harbor. The Helen R. Whiteley Center is simply heaven on earth.

Sincerely,
Margaret Brucia

For more information about the Helen R. Whiteley Center and how to apply go to http://depts.washington.edu/fhl

Save the Date

Friday Harbor Laboratories presents
The 6th Annual

Jazz at the Labs
at Friday Harbor Laboratories

Saturday, June 10, 2006

Featuring Dennis Willows and
"The San Juan Jazz Quartet + 1"
and
Ron Howell and Seattle's
Phenomenal Jazz Group "Chimera"

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

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

Scholarship / Fellowship Funds

Ellie Dorsey Memorial Fund:
Generates an annual gift presented to a student in memory of Ellie Dorsey.

Patricia Dudley Endowment
Supports the study of systematics and structure of organisms and marine ecology.

Fernald Fellowship Endowment:
Supports graduate students for studies of marine invertebrate development.

FHL Discretionary Fund for Excellence:
Provides funds for student aid and encourages diverse initiatives that benefit FHL.

FHL Research and Graduate Fellowship Endowment:
Supports graduate students and post-docs for marine science studies.

Anne Hof Blinks Fellowship Endowment:
Supports students of diverse backgrounds in marine science studies.

Illg Distinguished Lectureship Endowment:
Brings specialists to present lectures on invertebrate biology and to meet FHL students and researchers.

Kohn Fellowship Endowment:
Supports graduate study of invertebrate biology research and course work.

Marine Science Fund:
A current use fund to provide student aid for courses the following year.

Larry McEdward Memorial Fund:
Provides annual support for a graduate student in memory of Larry McEdward.

Mellon Mentor Endowment for Excellence in Research Training:
Provides faculty salary in support of internship in marine science, matched 1:1 by the Mellon Foundation.

Reed Undergraduate Endowment:
Scholarships to undergraduates for study of marine sciences.

Stephen & Ruth Wainwright Fellowship Endowment:
Fellowships for graduate students studying form and function of organisms.

Dennis Willows Director's Endowment:
Provides future FHL directors with discretionary funds for unbudgeted needs including student assistance.

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.

A New Fundraising Program - Adopt a Student

Objectives:

- For the summer session of 2006, Friday Harbor Laboratories hopes to raise an additional $75,000 to support 25 applicants who could otherwise not come to FHL or who could attend only half the summer.
- Donor families will be acknowledged by "their" student, have the opportunity for interaction with him or her during the summer, and receive a copy of the student's final paper, and other benefits.

How It Works:

- The program will provide $3,000 grants to 25 deserving students in need of support.
- To enable more people to "adopt a student," a donor can be teamed up with another donor and each can make a gift of $1,500.
- You can sponsor a student, or be paired with another sponsor by sending your check in the enclosed envelope.

Several FHL board members have already "adopted a student."

For more information, contact Bob Schwartzberg at rsberg@u.washington.edu or call him either at 360-378-2165, ext. 2 or 206-616-0760.

2006 FHL Courses

Spring Quarter (March 27-June 3):

- Marine Zoology/Marine Botany (Biol 430/445)

Research Apprenticeships:

- Comparative Biology of Egg Maturation and Fertilization (Biol 499)
- Marine Molecular Ecology (Biol 499)
- Neuroethology of Orientation Behavior (Biol 499)

Summer Term A (June 12-July 15):

- Marine Invertebrate Zoology (Biol 432)
- Comparative Invertebrate Embryology (Biol 536)
- Functional Morphology and Ecology of Marine Fishes (Biol 565)

Summer Term A & B (June 12-Aug. 19):
Research Apprenticeship:

- Biophysics of the Aquatic Gel Phase (Biol 499)
- Blinks Scholar Program

Summer Term B (July 17-Aug. 19):

- Marine Algae (Biol 539)
- Coastal and Estuarine Fluid Dynamics (Ocean 578)
- Predator-Prey Interactions (Biol 533)
- Larval Biology (Biol 533)

Autumn Semester (Aug. 21-Dec. 9):
Research Apprenticeship:

- Ecological and Evolutionary Analysis of Spatial Variation in Marine Systems (Biol 499)

Autumn Quarter (Sept. 25-Dec. 9):
Research Apprenticeships:

- Pelagic Ecosystem Function in the San Juan Archipelago (Ocean 499)
- Marine Fish: Ecology, Habitat Requirements and the Design of MPAs (Fish 492)
- Gene Network Dynamics and Cellular Behavior (Biol 499)

Application and information available at:
http://depts.washington.edu/fhl/

FHL Contributors ...

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

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Sylvia and Russell Yamada
Mitsuki Yoneda
Mark and Heidi Young
Lydia Zepeda

Gifts received through Oct. 15 2005.

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

It's been estimated that nearly 2/3 of Americans do not have a will... and many of those that do have a will have not updated it in the past 5 years.

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

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

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

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

For more information, contact:
Office of Gift Planning, Phone: 206-685-1001 or toll-free at 1-800-284-3679, Email: giftplan@u.washington.edu
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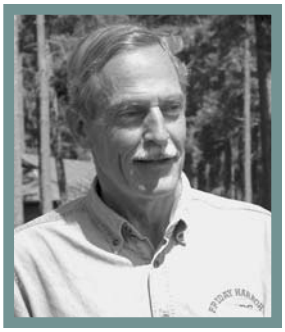
From the Director's Office...

Directing FHL has been extraordinarily satisfying because of the splendid FHL family (students, researchers, support staff) and because of the uniquely supportive environment provided by the biological and physical resources of the FHL and the University of Washington. It just doesn't get much better than that. On the other hand, returning to my research 'roots' also presents a wonderful prospect!

It's been at least a century since anyone has had a chance to discover the existence and physiological underpinnings of a new biological sense like sight, hearing, and taste. Thanks to the efforts of FHL people like Drs. Ken Lohmann, Shaun Cain, Raz Popescu and others, we are on the verge of discovering more about the animal magnetic sense. It is a zigzag story with promising leads, some of them false, but others tantalizing, because they open up unexpected and potentially important new fields of enquiry.

Early on, we discovered that a sea slug *Tritonia* has preferred magnetic headings it follows both in the lab and in the field. Also, if we surround the animal with wire coils to alter the magnetic field, the animal changes its preferred heading to the new magnetic cues provided by the currents in the coils. Later we found that certain re-identifiable neurons in its brain fire nerve impulses when the direction of the magnetic field around the animal is altered. So we know the animal senses Earth's magnetism and has accessible brain cells that register the signals.

A first guess was these same neurons might in fact be the magnetic sensors (e.g., like eyes are for light). That proved to be false, but it also provided a splendid example of how curiosity-driven science drives discovery. In the course of trying to understand what those neurons actually do, we discovered that they contain a new brain chemical (a neuropeptide) that regulates beating of epithelial cilia, like the ones that line human lungs, oviducts, brain ventricles, and in fact does control the beating the cilia on the foot upon which *Tritonia* glides. That of course, leads off in new and potentially helpful directions, because of disease conditions involving ciliated epithelia, such as cystic fibrosis, and infertility. This brain peptide is the first known to control directly the beating of ciliated cells in any animal.



But when we got back on the track of the magnetic sense, we found that neuron responses to changing magnetic fields require intact neural connections to the slug's foot. And that has led us now to a search of the foot tissue for structures that might be these magnetic sensory devices. Efforts by several people, including imaginative students (FHL Research Apprentices have been very much involved in this), now suggest that the sensing devices may be sub-microscopic magnetic particles acting like compass needles inside sensory neurons. I'm speculating, but these may be attached somehow to molecular gates inside cells, and these molecular compass needles may tug membrane channels open to create electrical signals that signal magnetic conditions to the animal's brain. Certainly other models are possible.

Tritonia diomedea (15 cm. long, foreground) in its normal field environment. Photo by R. Wyeth.

So for the next couple of years, with generous support from the National Science Foundation, we will try to figure out how these cells work. It will be great fun to be a part of the FHL family as a research scientist again!

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