

## EPSCoR Education Outreach in Sitka: "A Whale of a Tale"

—Heather Cox

Mt. Edgecombe High School in Sitka, along with Kodiak, Barrow, and Kotzebue high schools, are participating in EPSCoR's Alaska Rural Research Partnership program. Students and teachers at these high schools partner with UA researchers to explore a gene family called the MHC, which codes for proteins that help the immune system detect infection. These MHC genes allow the body to recognize "self" versus "foreign" and to determine when to initiate an immune response against viruses, bacteria, or even non-compatible organs from donors. The students focus on the diversity or lack of diversity of the DRB locus within the MHC, and thus evaluate the immune system capabilities within the species.

This year, Mt. Edgecombe High School students embarked on an adventure at sea to study the genetics of the humpback whale. Students participating in the genetics research were **Molly Manning, Forest Kvasnikoff, Donald Masters, and Ann Ferry**. Mt. Edgecombe science teachers Marty Johnson and Sara Smolenack, and UAF research technicians Jayme Ballantyne and Heather Cox, have assisted the students in their research this past



*Looking for humpbacks*

*Whale fluke.  
Photos by  
Jayme Ballantyne.*



academic year. Last October, the students and research staff had the opportunity to accompany Sitka marine scientists, Jan and John Straley, on a charter boat expedition to obtain humpback whale tissue samples. The Staleys have spent years observing the behavior of humpback whales and compiling a photo identification record of the yearly whale migration through Sitka. On this trip, John Straley utilized a non-invasive darting technique to collect tissue samples from humpback whales. The students had the pleasure

of learning both the science of sampling, data extraction and analysis, and the migratory history of each observed whale.

All four students presented scientific papers at the Alaska Statewide Science Symposium in Fairbanks this past March. Donald Masters presented an excellent scientific methods paper on the *DNA Extraction Optimization of Humpback Whale Skin Tissue*. Molly Manning and Forest Kvasnikoff placed fourth in the Molecular Biology Division with their project, *The Major Histocompatibility Complex and Humpback Whales*. Ann Ferry placed second in the Molecular Biology Division and fifth in the overall competition with her project, *Determining the Gender of Humpback Whales by ZFY/ZFX and SRY Gene*. Ann's fifth place overall allowed her to attend (as a non-competitor) the National Junior Humanities and Science Symposium in Colorado Springs in May.

## Congratulations to EPSCoR RFA faculty on recent federal research awards:

**Jocelyn Krebs, UAA (Alaska Genomic Diversity Initiative):** "Role of histone modifications in DNA double strand break repair." **National Science Foundation, \$330,000 2003-2006.**

**Matt Olson, UAF (Alaska Genomic Diversity Initiative):** "Conflict in a Gynodioecious Plant and the Cost of Male Fertility Restoration." **National Science Foundation, \$350,000 2003-2006.**

**Sasha Kitaysky and Alan Springer, UAF (Integrative Approaches to Environmental Physiology):** "Regime forcing and ecosystem response in the Bering Sea: Effects of inter-annual climate change on food availability, diet consumption and productivity of planktivorous and piscivorous seabirds". **North Pacific Research Board, \$900,000 2003-2006.**

**Lee Taylor, co-PI, UAF (Alaska Genomic Diversity Initiative):** "Collaborative Research: Orchid-fungal Interactions-a system for testing hypothesis about the ecological role and distribution of mycorrhizal fungi in affecting plant distribution." **National Science Foundation, \$100,000 (sub-award) 2003-2006.**



*John Straley,  
holding the  
non-invasive  
dartgun, and  
crew.  
Photo by  
Jayme  
Ballantyne.*

## Research Focus Area: Alaska Genome Diversity

### Biochemical Research - Tadpoles and Yeast

—Dr. Jocelyn Krebs, Department of Biological Sciences, UA Anchorage

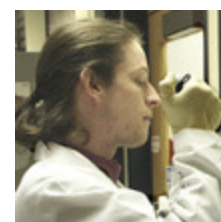


Faculty Researcher  
Jocelyn Krebs

Work in the Krebs lab focuses on two main research areas: how cells repair chromosomal DNA that has been damaged by chemicals or radiation, and the role of changes in chromosome structure throughout embryonic development.

A typical cell contains 1-2 linear meters of DNA compacted into a nucleus about 10 micrometers in diameter. The DNA is wrapped around histone proteins to form "chromatin". Histones are among the most highly conserved proteins in eukaryotic evolution, emphasizing the importance of organized DNA compaction. However, this critical compaction renders the DNA inaccessible for other essential functions of the cell, such as expression of genes or repair of damaged DNA. Cells have solved this paradox by selectively decondensing regions of the chromosomes when they are needed, then refolding the DNA when the work is completed. This process of changing the local structure of a chromosome is called "chromatin remodeling", and is performed by two classes of proteins: chromatin remodeling enzymes and histone modifying enzymes.

One objective of our research is to understand how chromatin remodeling facilitates the process of DNA repair, using the model organism, *Saccharomyces cerevisiae* (yeast). John Moore has undertaken a systematic mutagenesis of the histone H2A, and tested the mutants in a variety of DNA repair assays. He has shown that a number of amino acids in the H2A C-terminal "tail" region are critical for efficient repair of broken chromosomes. His work has led to a collaboration with a biotechnology company.



EPSCoR Fellowship student  
John Moore



Healthy tadpole at top,  
two mutant tadpoles  
are below.



EPSCoR Fellowship student  
Sara Dirscherl

Our other main focus is the role of chromatin remodeling enzymes in development. Embryonic development requires that different genes become expressed at precise times during development, as well as in precise locations within the developing embryo. Sara Dirscherl is studying the role of the Imitation Switch (ISWI) enzyme in the frog *Xenopus laevis*. She has shown that frog embryos lacking ISWI activity have severe defects in their neural development, including improper neural tube closure, spinal deformities, and eye defects. She is currently working to identify the particular gene targets that are improperly expressed in these defective embryos.

Photos by Jocelyn Krebs

## EPSCoR Announces 2003-2004 Internal Award Recipients

### UNDERGRADUATE SUMMER RESEARCH INTERNSHIPS

AGDI Christopher Barger, UAF  
Enola Hoffman, UAA

HLECC Bradley Burich, UAA  
Polina Borisova, UAA

IAEP Ryan Long, UAF  
Maegan Weltzin, UAF

ISCR Brian Mullen, UAA  
Anastasia Mironova, UAA  
Rae Dinsmore, UAF

AGDI: Alaska Genome Diversity Initiative  
IAEP: Integrative Approaches to  
Environmental Physiology  
HLECC: High Latitude Environments  
Contaminants Consortium  
ISCR: Infrastructure and Systems for  
Cold Regions

### NEW INITIATIVE (SEED) GRANTS

AGDI Terry Bowyer, UAF  
Jocelyn Krebs, UAA  
Matt Olson, UAF  
Joan Braddock, UAF  
Roger Ruess, UAF  
Richard Boone, UAF

IAEP Mike Castellini, UAF  
Brian Barnes, UAF

ISCR Wei Zhou, UAF  
Horacio Toniolo, UAF  
Yuri Shur, UAF  
Robert Perkins, UAF

### SMALL COLLEGE RESEARCH PARTNERSHIP GRANTS

Lee Ann Munk, UAA/Kodiak College  
Bill Schnabel, UAA/Alaska Pacific Univ.

### EQUIPMENT GRANTS

Yuri Shur, UAF  
Horacio Toniolo (2), UAF

### GRADUATE RESEARCH FELLOWSHIP AWARDS

AGDI Amy Carroll, UAF  
Sara Dirscherl, UAA  
Scott Pavay, UAA  
Sarah Sonsthagen, UAF

HLECC Julie Ahern, UAF  
Linda Blumberg, UAF  
John Clark, UAF  
David Fish, UAF  
Sara Hadden, UAA  
Christopher Hoffman, UAA  
Edda Mutter, UAA  
Santash Patil, UAF

IAEP Cheryl Clark, UAA  
Dana Greene, UAF  
Katrina Knott, UAF  
Ronald Tavernier, UAF  
Huiwen Zhao, UAF  
Todd Sformo, UAF

ISCR Matthew Bray, UAF  
Thomas Krause, UAF  
Stephen Muerer, UAF

## Undergraduate Student Researchers Achieve Results!

### *Roger Rothschild receives the 2003 Jens Peder Hart Memorial Scholarship*



Faculty mentor Dr. Larry Duffy (l) and Roger Rothschild.

Roger Rothschild received two EPSCoR Undergraduate Summer Research Internship awards to support his 2001 and 2002 summer field research activities. His 2001 project was a *Report on Total Mercury in the Common*

*Prepared Subsistence Foods of a Rural Alaskan Village*. He used his funding to collect preliminary data on THg levels across a wide range of subsistence food sources—fish, marine mammals, and land mammals, in the rural village of Napakiak. In 2002, Roger investigated a possible correlation between brain tissue mercury levels and low reproductive rates in Alaskan waterfowl. His related research activities include dietary surveys of subsistence foods consumption, and measuring mercury levels in hair samples from Native and non-Native populations. He has published several articles on his findings with his faculty mentor/advisor Dr. Larry Duffy of the UAF Dept. of Chemistry and Biochemistry.

The American Society for Circumpolar Health recently announced that Roger has been awarded the 2003 Jens Peder Hart Hansen Memorial Fellow Scholarship. Dr. J. P. Hart Hansen was the former chairman of the Nordic Council for Arctic Medical Research and former president of the International Union for Circumpolar Health. Scholarships for \$1000 are awarded to emerging researchers in the field of circumpolar health to increase international cooperation in circumpolar health research and education. Roger was accepted into the UAF graduate chemistry program in May 2003, with continuing and new interests in heavy metals contamination and transition metals chemistry as it pertains to toxicology. Following his graduate program, he hopes to continue his education and training in a medical field, either MD, PA, or MPH.



### *Pilot Study Paves the Way to Graduate School for Corrie Baird Whitmore*



Corrie Baird Whitmore, faculty mentor Dr. Anita Hartmann, and "Bob".

Corrie Baird Whitmore received an EPSCoR Undergraduate Research Opportunities Program award to conduct a *Pilot Study of the Effects of Dietary Antioxidants on Learning and Memory of Mature Rabbits*. Working closely with Corrie is her faculty mentor, Dr. Anita Hartmann, of the UAF Psychology Department. Corrie is testing one theory on aging that attributes the

decline in cognitive abilities to the accumulation of free radicals within the body. She is working with four mature Holland lop rabbits with available baseline cognitive performance data as juveniles. Her research design and treatment involves a diet switch from full-nutrient rabbit chow plus fresh lettuce, kale, apples, and celery, to a diet rich in items high in antioxidants such as spinach, blueberries, grapes, and carrots. Pre- and post-tests of cognitive-behavioral tasks (time to exit carrier into a novel environment, time to navigate a T or Y maze, and time to solve a complex blocked-food path task) are used to measure increase in cognitive ability.

The results of Corrie's project are in, and the rabbits do get better at their tasks. Other good news is that she has been accepted to the graduate schools of her choice. Both Colorado State University and Virginia Tech have offered Corrie admission, full tuition waivers, and 100% assistantships in PhD programs in Industrial and Organizational Psychology. Each school asked for research experience in candidates, and Corrie's rabbit story featured well. She tied for first choice candidate at CSU and was one of only 5 successful applicants in a pool of 80 at Virginia Tech. Assuming all goes as planned, she will be attending Virginia Tech next year.

"Buddy" retrieves a tasty treat, after knocking over the tube blocking the food.

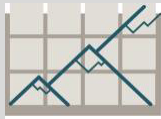


Photos by Nora Kelly

Alaska EPSCoR invests in the future of talented student investigators through two competitive award programs. The summer program provides up to \$5,000 for living expenses and related supplies to support summer research activities. The Undergraduate Research Opportunities Program (UROP) awards up to \$2,500 for research activities during the academic year.



## EPSCoR Outreach to Alaska Business Entrepreneurs



**Alaska  
Small Business  
Development Center**

Alaska EPSCoR is looking to assist highly motivated small business entrepreneurs wishing to develop new technologies through participation in Small Business Innovative Research (SBIR) programs. SBIR programs operate within U.S. federal agencies and provide grants to small businesses to encourage innovative research ideas and

technological developments with commercial potential.

Alaska EPSCoR partners with the UAA Small Business Development Center (SBDC) to offer a Small Business Innovative Research (SBIR) Phase 0 Program. Phase 0 programs are designed to identify pre-SBIR ideas that show promise for SBIR Phase I success. Alaska EPSCoR provides \$50,000 annually to the UAA SBDC Technology Research and Development Center (TREND) for individual mini-grants of up to \$8,000 to small business owners to offset the preparation costs of first-time SBIR Phase I proposals. In addition, TREND program staff provide small business counseling and training in grantsmanship, marketing and commercialization, and business planning.

Most small businesses meet the basic eligibility requirements (less than 500 employees, organized for profit, and US owned and operated); the challenge is to match new technology research and development ideas with the federal agency's specific concerns and interests. For more information about SBIR programs in Alaska, call the UAA Small Business Development Center at 907-274-7232 or go to <http://trendalaska.org>



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