

Department of Botany Newsletter

Spring 2010

University of Wyoming

Students Awards Announced

Highly motivated; an exemplary student.

Worked efficiently for long hours in the field even when the weather was lousy.

The top undergrad of 10 who have worked in my lab during the last two years.

Rarely have I seen teaching evaluations that were so consistently good.

Such comments provided the basis for selecting this year's student award winners. Never an easy task, the selection committee of **Professors Ramesh Sivanpillai, Kiona Ogle** and **Dan Tinker** reviewed many nominations and selected 14 winners. Some of the awards included scholarships that have been made possible by the generosity of our alumni and others.

The undergraduate winners included two *Outstanding Juniors*—**Noah Berg-Mattson** and **Carolyn Swift**. In addition to fine academic records, Noah was recognized for his outstanding work as a field assistant in Yellowstone National Park and as an intern in the Rocky Mountain Herbarium, and Carolyn for her outstanding work as a research assistant, also in Yellowstone.

The committee decided there was good reason for a 3-way tie for the *Outstanding Senior* award, which went to **Robert "Bob" Shriver, Samantha Stutz** and **Brian Ward**. Bob has completed several independent research projects, some of which will be submitted for publication. Samantha distinguished herself by consistently demonstrating academic leadership in the classroom. She was also the recipient of one of the 20 prestigious *Outstanding Arts & Sciences Graduating Senior* Awards. Brian received strong endorsement from several faculty members who have interacted with him in their classes over the past four years.

Two undergraduates were honored with this year's *Penland Scholarship*. **Noah Berg-Mattson** was one recipient, again for his work in Yellowstone and the Herbarium, and **Matthew Schreiner** was the other for his exceptional assistance with highly technical work as a research assistant in molecular biology.

Rick McNeil was this year's recipient of the *Aven Nelson Fellowship*, and **Ben Legler** was the recipient of the *Wilhelm and Ragnhild Solheim Scholarship*. Both are graduate students in plant sys-

tematics. Rick's work on the flora of the Lewis and Clark National Forest and his leadership in the Herbarium was exemplary, and Ben took the lead in rebuilding the Rocky Mountain Herbarium Access database, with information on 670,000 species now accessible by anyone over the web. Ben's computer work was done while he also worked on the flora of a ranch in New Mexico owned by Ted Turner, where he discovered two new species in the genera *Botrychium* and *Phlox*.

One of the most coveted recognitions is the *Outstanding Botany Teaching Award*, given to graduate students who excel as laboratory teaching assistants. **Sara Beaver** and **Matthew Rubin** were the recipients this year. Nominators noted that "Sara goes above and beyond her expected teaching duties and has become an excellent educator and mentor." For Matthew the nominator wrote, "He received the best evaluations I have ever seen for a TA, and he helped me by proposing improvements for the course."

Numerous students help our department in extraordinary ways, and in some years the contributions of one or two are judged as meritorious of the *Botany Service Award*. There are two recipients this year—**Sara Beaver** and **Rachel Jones**. Sara was selected because of her role as the graduate student representative to the faculty, as well as regularly helping out with the weekly Botany seminar. Rachel was honored because of the amount of work that she did as a volunteer, which included serving as an unofficial TA even when funds were not available to pay her.

Also awarded were two grad student fellowships to facilitate summer research, which are granted based on applications submitted by the students. **Monia Haselhorst** received the *H. T. Northen Fellowship*, and **David McKenzie** and **Michael Fell** split the *C. L. Porter Fellowship*.

All of these awards were announced at a meeting attended by students, faculty and staff, an occasion when many attendees learn about the history of the department as they are told about the accomplishments of the individuals for whom the awards are named. Alumni and friends interested in contributing to these awards, or establishing new awards, should contact Department Head **Greg Brown**.

Faculty, staff and student accomplishments

Two of our undergraduate students, **Samantha Stutz** (Botany) & **Megan Bagley** (Physics & Biology) were selected as Top 20 Graduates in 2010 from the College of Arts & Sciences.

Professor Steve Jackson is the editor of a book written originally in German by pioneer botanists Alexander von Humboldt and Aime Bonpland, *Essay on the Geography of Plants*. Published by the University of Chicago Press in 2009, Steve introduces this first translation into English and explains the book's significance two centuries after publication. The translation was done by **Sylvie Ramonowski**.

Professors **Mark Lyford** & **Greg Brown** both received University awards for promoting intellectual engagement among first year students.

Professor **Greg Brown** was appointed the first Director of the new Berry Biodiversity Conservation Center.

Professors Bill Reiners and **Jeff Lockwood** are the authors of a new book, *Philosophical Foundations for the Practices of Ecology*, published by Cambridge University Press.

For calendar year 2009

- Botany faculty had \$10.3 million dollars of research grant support
- Botany faculty had 76 peer-reviewed publications

Effects of CO₂ and Warming on Grasslands

During the last 10 years, **Dr. Elise Pendall** and her students have been studying how prairie ecosystems in Colorado and Wyoming respond to climate change. Last year she had the opportunity to study grasslands in Australia during a sabbatical leave.

Global warming is influenced by the amount of carbon dioxide in the atmosphere. Notably, more CO₂ can also stimulate photosynthesis, up to a point, and warmer temperatures increase rates of plant respiration and decomposition of soil organic matter. The question is, What is the combined effect of these various influences on the grassland ecosystem?

Elise is one of the PIs on the Prairie Heating and CO₂ Enrichment (PHACE) ecosystem manipulation experiment, which has been running since 2006 at the High Plains Grassland Research Station near Cheyenne. The treatments involve adding CO₂ to the atmosphere of small plots and increasing the soil temperature of those plots using buried heaters. The group has found that, although elevated CO₂ stimulates growth of the native grasses, it also increases rates of carbon loss from the eco-

system. This leads to less carbon storage in prairie soils than would be expected after just a few years. When warming is combined with atmospheric CO₂ concentrations to simulate conditions expected near the end of the century, even greater carbon losses occur. Research is now underway to determine possible explanations for this finding, and also to determine how changes in plant species might alter the results.

In Australia, Elise is collaborating with **Dr. Mark Hovenden** on a similar experiment in a native grassland in Tasmania. This experiment has been running since 2001. After seven years they have found strong effects of the treatments on soil carbon storage, just like in Wyoming. Interestingly, under C3 species such as wallaby grass, soil carbon accumulated in response to elevated CO₂, whereas under the main C4 species, kangaroo grass, soil carbon decreased. This influence of plant species on ecosystem carbon cycling has not been previously reported. Because the prairie in Wyoming has similar C3-C4 composition, Elise and her students have the opportunity to compare possible mechanisms underlying this



Tea time is always a welcome break on a field trip in Tasmania.

response. Their research demonstrates that climate-carbon interactions are not fully revealed by studying only above-ground plant responses.

Molecular Biology in the Field



Shane Severs and Alice Brantz collect water samples from the source of Big Spring, at Thermopolis, with assistance from Blaire Steven. Photo: Michelle Sait

For several years the faculty and students at Central Wyoming College in Riverton have been studying the hot springs in nearby Thermopolis. As with similar habi-

tats in Yellowstone, such thermal features provide wonderful opportunities for learning about how bacteria and other microorganisms are able to survive in hot water (in this case 127°F). When one of the CWC students, **Sage McCann**, transferred to UW for his B.S. degree and decided to major in molecular biology, a link was forged with the research lab of **Dr. Naomi Ward**, who holds a joint appointment in the Department of Botany and Department of Molecular Biology. Naomi came to UW in 2007 and is especially interested in the molecular aspects of microbial physiology, ecology and evolution in extreme environments.

With new ideas in mind for research that could be done, a group of ten UW students and six CWC students, along with their mentors, traveled to Thermopolis last fall to gather more samples and environmental data, and to learn about the origin of the springs. About the trip, Naomi said, “We all gained a better understanding of the interactions of biology, chemistry and geology in determining the nature of these unusual

microbial communities.”

After the trip, the students learned a variety of molecular methods pertinent to identifying microbes that they had collected. Traditional methods with agar in Petri dishes always miss many of the microbial species in natural environments, simply because the species don't grow or cannot tolerate the agar environment that is provided. The alternative is to identify the different kinds of organisms through DNA sequencing, using a gene that is universally distributed due to its essential role for encoding the RNA component of ribosomes. The students have now done this and will present papers at upcoming meetings.

Naomi added, “This collaborative effort between UW and CWC has been a good experience for the faculty and students of both institutions. We hope it can continue and that such projects continue to be developed with other colleges.”

Ecological Genetics

The research in **Dr. Alex Buerkle's** lab is some of the first in ecological genetics to take advantage of recent breakthroughs in DNA sequencing technology. Along with his associates, Alex is providing detailed genomic analyses of the history and processes of evolutionary diversification in the western United States, using novel computational analyses to uncover the genetic basis of adaptive variation within quite different organisms.

For example, **Monia Haselhorst** (Ph.D. student) and Alex are studying hybridization between white and Englemann spruce, to understand better their ecophysiology and distributional limits, while **Zach Gompert** (Ph.D. student) focuses on hybridization among Lycaei-

des butterflies in the Rocky Mountains. The goal is to understand the nature of barriers between species and the processes associated with the origin of new species.

Also, **Qiurong Wang** (Ph.D. student) and Zach Gompert are both developing statistical methods for genetic analyses of hybrids and genomic differentiation, and a postdoctoral researcher in the lab, **Tom Parchman**, is studying the genetics underlying variation in cone serotiny in pines (retention of seeds in cones until they are released by high temperatures).

To learn more, visit Alex's web site at www.uwyo.edu/buerkle.



Alex Buerkle uses DNA to study western plants

New Faculty

Dr. Kiona Ogle has a joint appointment in Botany (75%) and Statistics (25%). She received a B.S. in Biology and Math from Northern Arizona University (1997) and an M.S. in Statistics and a Ph.D. in Biology from Duke University (2003). Her advisor at Duke was **Professor Jim Reynolds**, who received his M.S. degree in our department in 1971. Prior to arriving at UW, Kiona completed a 2.5-year post-doctoral position at Princeton.

Kiona's research has two major themes. One is focused on understanding variation in various physiological, morphological, anatomical, and allometric characteristics of 300+ tree species across North America. An

ultimate goal of this work is to learn how variation in these traits affects species diversity, productivity, and responses to climate change. Another theme is devoted to quantifying the mechanisms controlling carbon and water dynamics in arid and semi-arid ecosystems across the western states. The objective of this work is to learn how deserts and shrublands may be impacted by altered precipitation regimes associated with climate change. One study in particular is examining the implications of altered snowpack dynamics for carbon cycling. Both themes develop and apply statistical and mathematical modeling techniques to learn how environmental perturbations affect plant and ecosystem behavior.



To learn more about Kiona's research and teaching program, visit her Web site at www.uwyo.edu/oglelab.

Dr. Cynthia Weinig came to UW in September 2007, with a split position between Botany and Molecular Biology. Prior to arriving at UW, Cynthia was a faculty member in the Department of Plant Biology at the University of Minnesota-Twin Cities, where she was named to a McKnight Professorship, recognizing her early-career research success. Immediately prior to starting her first position, Cynthia received an NSF Young Investigator Award from the Plant Genome Research Program. The project focuses on characterizing loci underlying plant responses to density, a critical feature determining yield of crop plants and fitness in wild species. A second NSF award, in collaboration with researchers at Dartmouth College and the University of

Wisconsin, is examining genetic mechanisms of adaptation to latitudinal variation in climate. Both of these projects continue at Wyoming. Cynthia's favorite course at the moment is Genetics, where she aims to engage students via active-learning exercises.

On a more personal note, Cynthia, her husband, Bryan Shuman, (Assoc. Prof. in Geology), and their children (Emmet, Eleanor, and Henry) enjoy the outdoor opportunities afforded by Laramie.

To learn more about Cynthia's research and teaching program, visit her Web site at <http://uwadmnweb.uwyo.edu/Botany/faculty/Weinig.asp>.



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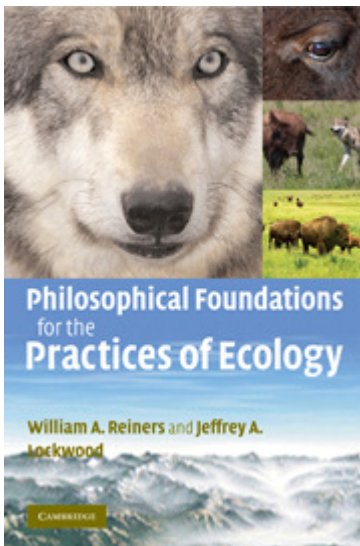
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New Book: Ecology and the Philosophy of Science



When **Bill Reiners** and **Jeff Lockwood** (professor in UW's Department of Philosophy) organized a one-semester Botany seminar in 2005, they didn't realize how that initiative would consume a good part of their next four years. With fifteen motivated students, they investigated how ecologists think, and also how ecologists approach their work from a variety of different perspectives. It became evident that the terms *hypothesis*, *theory*, *law*, *principle*, *paradigm*, *model*, *empiricism* and *evidence* mean different things to different people. As the semester ended, Bill and Jeff decided to write an essay on the subject, but that gradually grew into a book. Titled *Philosophical Foundations for the Practices of Ecology* and published by Cambridge University Press in 2009, the book will help ecologists place their work in a comprehensive philosophical framework and will help sharpen the focus on controversies in the profession.

Bill is the author of another book published by Cambridge University Press, in 2004. Co-authored with UW botany graduate **Ken Driese** and titled *Transport Processes in Nature*, this book provides a new and highly detailed perspective on how ecological events or conditions in one area have influences elsewhere on the landscape.

Deceased

Our Department was sad to learn that **Dr. Linda Wallace** lost her battle with cancer late last year. Linda received her M.S. degree in Botany at UW in 1975 and was a Nobel Presidential Professor of Botany at the University of Oklahoma.