PENN STATE Ecology

Notes from the Field

spring 2013

The biannual newsletter of the Intercollege Graduate Degree Program in Ecology at The Pennsylvania State University

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Photo by Laura Russo

Spring 2013 Ecology Seminar Series a "Diverse" Success

By Jenny Tennessen and Gail McCormick

The Ecology Program's graduate student-run spring seminar series concluded on Earth Day, with the thirteenth speaker in a lineup that featured Daniel Simberloff, Mercedes Pascual, Steven Allison and Andy Sih, among other prominent ecologists, from thirteen universities and agencies across the country, including UC-Davis, Cornell University, Notre Dame, the University of Wisconsin, and Oak Ridge National Laboratory.

The theme, "Coping with Global Environmental Change," challenged speakers and audience members alike to explore ways in which ecological units from microbes to ecosystems are responding to a changing world. The importance of diversity (behavioral/physiological as well as genetic and species) in responding to change, and the necessity of incorporating modeling approaches in order to explore and anticipate likely future outcomes, emerged as recurring messages that tied seminars together.

Besides attending weekly seminars (an average of forty-seven people per seminar), the series offered undergraduate and graduate students, postdocs and faculty members many opportunities to meet speakers on campus or over free meals. Overall, folks representing nineteen departments or programs across campus enjoyed 138 different opportunities to discuss research, seek career advice, or pontificate about ecology.

Unique opportunities included collecting wood frog egg masses with Dr. Andy Sih in the nearby State Game Lands, touring an insectary with Dr. Mercedes Pascual, learning about NSF funding opportunities in biological sciences from Dr. John Wingfield (who, in addition to studying eco-immunology, currently wears the hat of assistant director for the Directorate of Biological Sciences at NSF), and soaking up tips about pursuing careers in the field during a Q&A session with Dr. Daniel Barshis and budding marine biologist undergraduates.

The seminar's success was largely due to the generosity of a record nine units across campus. We extend tremendous thanks to The Huck Institutes of the Life Sciences, the Environment and Natural Resources Institute, the Penn State Institutes of Energy and the Environment, the Eberly College of Science, the Earth and Environmental Systems Institute, the Department of Biology, the Department of Geography, the Center for Brain, Behavior and Cognition and, of course, the Intercollege Graduate Degree Program in Ecology. Thanks, as well, to the many folks who participated by attending seminars, coordinating schedules, meeting with speakers, shuttling to/from the airport, and generally showcasing Penn State's strengths in ecology.

Desert Tortoise Contact and Disease Transmission Research Heating Up in the Mojave

By: Christina Aiello

While spring in State College has barely begun, we've hit our first triple digit temperatures in the Mojave Desert. Hotter days mean earlier mornings and it won't be long before I'm collecting data by light of headlamp. Working with a federally threatened species, the desert tortoise (Gopherus agassizii), in one of the harshest landscapes in the U.S. has its own peculiar challenges. But not even the 50 mph spring gusts (I call them windy Wednesdays) keep us from a day's work; an observation made first-hand recently by a *Wall Street Journal* reporter who made a valiant attempt taking notes regarding our research collaborations with the military while his notepad flapped relentlessly in the wind at my field site at the Fort Irwin National Training Center. We are often battling the elements while partnering with both the U.S. Departments of Defense and Energy to conduct unique research on tortoise population and disease dynamics at multiple spatial scales.

Desert annuals are blooming, and after five long months of underground winter dormancy, the desert tortoise is ready for an active social life. It can be difficult to capture these fleeting encounters between animals in the field, so we are using specially designed, miniature proximity loggers to get a detailed look at who is mingling with whom. Using social network analysis, we're constructing contact networks of populations in the wild and in semi-natural enclosures to identify important patterns in social behavior that may be crucial to understanding and modeling infectious disease transmission. The desert tortoise suffers from a chronic, infectious upper respiratory tract disease whose mode of transmission is not well understood. My research this year focuses on how the quality of close contact and the strength of a pair's association may affect the likelihood of pathogen transfer between captive animals. I am also documenting how infection may disrupt or alter behavior and potentially the rate or quality of contact between animals. This is the first step in a broader project, funded by the NSF and headed by Peter Hudson and the U.S. Geological Survey, whose goal is to model tortoise contact networks and predict the risk of outbreak within a population generated by an animal translocation event.

Left: Wild desert tortoise with radio transmitter and proximity logger: a device that will document the frequency and duration of contacts between animals (Photo by Patrick Emblidge, Penn State Research Assistant). **Top Right:** A male desert tortoise courting a female outside of a rock den in Southern California. (Photo by Patrick Emblidge, Penn State Research Assistant). **Bottom Right:** Ecology graduate student, Christina Aiello, instructing research assistant John Jozkowski on assessing tortoise health and collecting tissue samples at the Desert Tortoise Conservation Center in Las Vegas, NV. (Photo by Margarete Walden, Penn State Research Assistant).

Ecology Students and CarbonEARTH

By Christy Rollinson & Katie Gaines

Above: Katie Gaines with partner teacher, Cindy Lee Hart.

Two ecology students, Christy Rollinson and Katie Gaines, were funded by the NSF CarbonEARTH program for the 2012-2013 academic year. The mission of CarbonEARTH is to improve the science communication skills of graduate students performing carbon-related research through partnerships with science educators in public schools. While the program also partners with 4-8th grade classrooms in Philipsburg-Osceola school district, Christy and Katie were paired with 7th and 8th grade science teachers in Harrisburg's Rowland and Ben Franklin schools.

Christy worked with Brian Kirkpatrick's 8th grade science class at Rowland School to strengthen the existing earth science curricula and prepare students for mandated standardized testing with active learning. Activities emphasized how science is conducted and the use of physical or conceptual models to aid learning. While studying topography, the students built 3-D models of topographic maps to help understand how landscape features such as mountains and valleys are described by contour lines. Christy brought her research into the classroom where the students used tree cores to see how climate and biotic factors interact to affect tree growth. In February, several students had the opportunity show off their work to scientists from an array of disciplines, including two Nobel laureates, when they participated in the 2013 CarbonEARTH Carbon Conference at Penn State.

Katie Gaines collaborated with Cindy Lee Hart at the Ben Franklin School for 7th grade life science and 8th grade earth science classes. The objective for the year was to build upon academic science standards by incorporating hands-on activities and ecology-oriented lessons. Katie focused her lessons on exploring local ecosystems, with a fieldtrip to Wildwood Park in Harrisburg as a starting point. Students from the 7th grade investigated soil microorganisms using microcosms and studied local food webs by researching organisms that live in various habitats within the park. The 8th grade students conducted water quality tests to evaluate two areas of Paxton Creek for nutrient pollution. After they discovered elevated nitrate and phosphate levels in the creek water, they completed a final project with stream tables to learn how these nutrients move in the environment.

For more information, please visit http://carbonearth.org.

USDA Agricultural Research at Penn State

By Sarah Goslee

The building directly across from the Creamery, the one you've probably never been in or even thought about much, has been there since 1936, when this part of campus was all agricultural fields and not much else. Back then, it held the U.S. Regional Pasture Research Laboratory and since 1994, it has housed the combined USDA-ARS Pasture Systems and Watershed Management Research Laboratory (always shortened to PSWMRU).

The Agricultural Research Service is the research branch of the USDA. The ARS, as a whole, has over two thousand scientists and does anything and everything related to agriculture and food—from food safety to vegetable breeding to pesticide research. As the names suggests, this ARS lab does mainly agroecology work. We have three major research projects with eleven scientists, and numerous support staff, postdocs and graduate students. The three projects focus on pasture ecology and biofuels, water quality and conservation practices, and integrated agricultural systems. Our scientists work closely with Penn State. Most of us are adjunct faculty in plant science, environmental management, or agricultural engineering, and we all work closely with other Penn State faculty and graduate and undergraduate students.

The PSWMRU has scientists working on water chemistry, landscape ecology, biofuels, plant physiology, soil science, hydrology, simulation modeling and much more. Our goal is to support environmentally and economically sustainable farming in the Northeast by improving agroecosystem management.

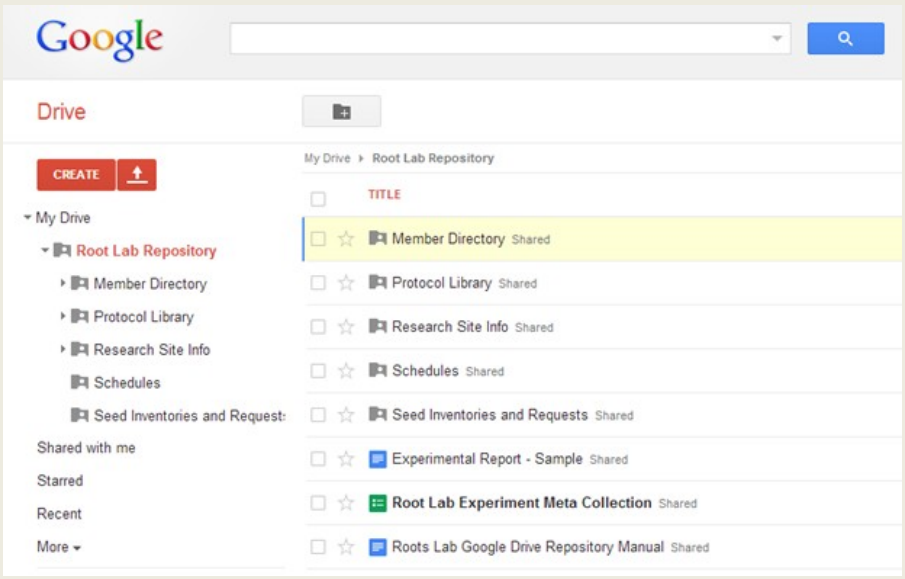
Above: USDA ARS building at Penn State. For more information, please visit http://www.ars.usda.gov/naa/pswmru

Online Lab Repositories: Solving the problem of sad messes of drives and cables

By Larry York

My lab has a secret drawer full of USB flash drives and external hard drives. In this sad mess of cables and plastic lies the final resting place of numerous graduate students' data, some of which was published and some of which remains orphaned. In a large lab, people come and go frequently, and it can be challenging to keep track of data and what lab members are working on.

We began using Google Drive in 2010 to share spreadsheets containing seed inventories and in 2011 for scheduling lab help. It was simpler than passing Excel files around or keeping a paper record. In order to solve the problems of data storage and dissemination, as well as the difficulties in keeping track of experiments being conducted in the lab, we decided to create an online lab repository in Google Drive. We quickly found more uses for it.



Above: Screenshot shows what the user sees after logging in to the Root Lab Repository. The Member Directory contains a folder for each lab member, within which they add experimental reports and data. The Experiment Meta Collection is a list of past, current, and planned experiments with columns for specific details, such as investigator, species, and stress imposed. These make up the heart of the repository, but other uses include housing a protocol library and schedules.

A lab Google account was created with its credentials known to the lab PI and the managing person. Within this lab account's Google Drive, one folder was created named Lab Repository. Lab members were added in the account's Gmail service and added to a Lab group. The Repository folder was shared with View privileges with the Lab group. Anything created within the Repository will inherit those permissions.

A spreadsheet was created within Repository called Experiment Meta Collection. Each row represents an experiment, with columns for the investigator, species studied, traits studied, treatments, location and a few other relevant fields. A form was created that users fill in to populate the collection spreadsheet. Only the Repository manager and Collection managers have edit privilege for this collection, so most members can only enter a new experiment through the form and view the spreadsheet to see what others are doing.

A Member Directory folder was added to the Repository, within which a folder was created for each lab member. By default, all lab members can view another member's folder and its contents. A particular lab member's folder had its ownership transferred to their Google account (an option in the item share dialog). Google Drive comes with 5 GB of data for each owner and additional data storage may be purchased. Being the owner, of course, gives full edit privileges, so each member's folder can only be edited by its owner and the Repository manager, but seen by everyone.

When a lab member wants to add a new experiment, they first create a folder for that experiment within their member folder. They then fill out a sample experimental report located in the root of the Repository and save it to that same folder. The experimental report contains detailed information about the experiment, initially for the plans for how to conduct it and some background, and eventually with a summary of results. They then fill out the form as described above to populate the Meta Collection and include a link to the experiment folder. Any data stored in the repository includes metadata describing the data, basic information about the experiment and a link to the report, how measurements were taken, and any calculations that were done.

Creating a Lab Repository with an online platform has made it easier to manage complex operations and to share and backup data, and has encouraged collaboration. Since the Repository's creation we've also added our entire pro- tocol library and a folder for various schedules. Physical backups piled in depressing heaps in hidden drawers may not go away anytime soon, but at least they can stay hidden while we ascend to the cloud and get all Borg on it.

For more information, visit http://plantscience.psu.edu/roots/methods/computer/repository.

Publications

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Du, W., **T.R. Robbins,** D.A. Warner, T. **Langkilde**, R. Shine. (*In press*). Latitudinal and seasonal variation in reproductive effort of the eastern fence lizard (Sceloporus undulatus). *Integrative Zoology*.

Fernandez, C.W., McCormack, M.L., Hill, J.M., Pritchard, S., & Koide, R.T. (2013) On the persistence of *Cenococcum geophilum* ectomycorrhizas and its implications for forest carbon and nutrient cycles. *Soil Biology & Biochemistry*. http://dx.doi.org/10.1016/j.soilbio.2013.05.022

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Hill, J. M., Walsh, J. ,Kovach A. I. , & Elphick, C. S. (2013) Male-skewed sex ratio in in Saltmarsh Sparrow nestlings. *The Condor* 115(2).

Kerby, J. & Post, E. (*In press*) Capital and income breeding traits differentiate trophic match-mismatch dynamics in large herbivores. *Philosophical Transactions of the Royal Society, series B*.

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Marden, J.H., Fescemyer, H.W., Schilder, R.J., Doerfler, W.R. & Wheat, C.W. 2013. Genetic variation in HIF signaling underlies quantitative variation in physiological and life history traits within lowland butterfly populations. *Evolution* 67, 1105–1115.

Niño, E.L., Tarpy, D.R., & **Grozinger, C.M.** (*In press*) Differential effects of insemination volume and substance on reproductive changes in honey bee queens (*Apis mellifera* L.). *Insect Molecular Biology*.

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Nunes, F.M.F., Silva, A., Barchuk, A.R., Bomtorin, A.D., **Grozinger, C.M.** & Simoes, Z.L.P. (2013) Non-target effects of double-stranded RNA constructs used in honey bee RNAi assays. *Insects* 4(1): 90-103.

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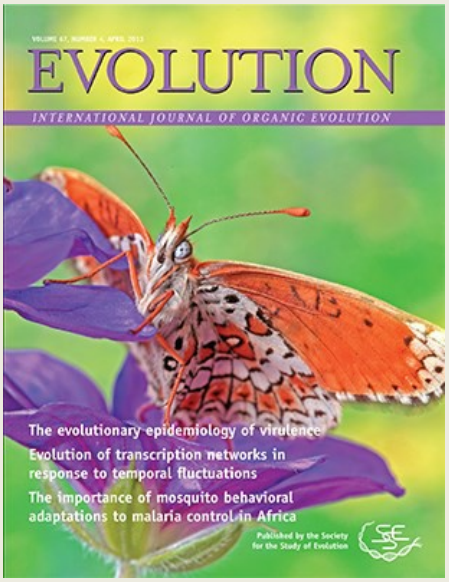

Above Cover image for Jim Marden and colleague's paper featured in the April 2013 issue of *Evolution*

Richard, F.J., Holt, H.L., & **Grozinger, C.M.** (2012) Effects of immunostimulation on genome-wide gene expression, chemical communication and social behavior in honey bee workers (*Apis mellifera*). *BMC Genomics* 13: 558

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Stuble, K., Rodriguez-Cabal, M.A., **McCormick, G.L.** , Dunn, R.R. & Sanders, N.J. (*In press*). Tradeoffs, competition, and coexistence in eastern deciduous forest ant communities. *Oecologia*. DOI: 10.1007/s00442-012-2459-9

York, L. M., Nord, E. A., & Lynch, J. P. (*In press*). Integration of root phenes for soil resource acquisition. *Frontiers in Functional Plant Ecology*.

Grants, Fellowships, Awards, and Other Achievements

Jason Kaye was awarded with the Ecology Program's Bellis Award

Jennifer Tennessen was awarded the Ecology Program's Horton Award and the Andersen Award. She was also awarded with Gaige Award from the American Society for Ichthyology and Herpetology. Jenny also received a Grant-in-Aid of Research, Sigma Xi, The Scientific Research Society.

Ecology Program Alumnus, **Dan Grear**, took a job offer from the USDA in Veterinary Services (USDA-APHIS-VS-CEAH) in Fort Collins, CO. He will be conducting research to support policy and mitigation of wildlife-livestock/poultry diseases.

Christina Aiello was quoted in an article titled "The few, the Proud, the Tortoises: Marines Protect Endangered Species" in the *Wall Street Journal*.

Lindsey Swierk was awarded the Graduate Student Outreach Award and the Graduate Student Service Award.

The Environmental Law Institute has announced that **Robert P. Brooks** has received the 2013 National Wetlands Award for Science Research.

Morgan Wiechmann, was awarded a Joint Fire Sciences Program, Graduate Research Innovation Grant: Quantifying the effect of fuel size on charcoal formation during prescribed fire, co-PIs: Matthew Hurteau, Jason Kaye, $23,612.

Bradley Carlson won the Best Student Paper in the Division of Animal Behavior at the SICB Annual Meeting.

David Watts was awarded with an Arctic Institute of North America's Grant-in-Aid , $1,000.

Lauren E. Chaby received the Latham Memorial Graduate Award, given annually to an outstanding, full-time graduate student advised by Wildlife and Fisheries Science faculty members in Penn State's School of Forest Resources.

Nick Polato accepted a postdoctoral position at Cornell University working with the EVOTRAC project (www.eeb.cornell.edu/evotrac).

Students from the Ecology Program competed in the Graduate Student Association's (GSA) Graduate Cup this past April and placed 19th! Congratulations to **Jennifer Tennessen, Chad Nihranz, Spencer Carran, Emilia Sola-Gracia, Kelly Brossman, Laura Radville, Morgan Wiechmann, Wren Patton, Chris Fernandez, Jeff Kerby and Jennifer Berkibile**. For a breakdown of the individual event results please visit http://www.pennstategsa.com/1/post/2013/04/graduate -cup-results.html.

Recent Program Graduates

Big congratulations to all the spring s emester graduates!

Marc Goebel, Ph.D.; Molly Steele, M.S.