PENN STATE Ecology

Notes from the Field

Spring 2021

The biannual newsletter of the Intercollege Graduate Degree Program in Ecology at The Pennsylvania State University
Volume 17 – No 2

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PC Trevor Drees, Emily Gagne, Olivia Trase

New Ecology Faculty

Franny Buderman (ESM) Franny is a quantitative ecologist interested in the development and application of novel statistical methods for understanding ecological systems. They primarily focus on understanding wildlife demography, space-use, movement, and their interactions across ecological scales. Their research spans numerous taxa and management applications. Her website is linked here

Brad Cardinale (ESM) Brad joins us as the new head from the Ecosystem Science and Management Department. He hails from the Cooperative Institute for Great Lakes Research in the School for Environment and Sustainability at the University of Michigan where he served as Director and Professor. News article here

Heather Hines (BIO/ENT) The Hines Lab studies insect evolution, diversity, and conservation, focusing on bees and wasps. Our research integrates across biology, from molecular (genomics, development, chemistry) to ecological, to address multiple facets of biodiversity. Her lab website is linked here

Jason Keagy (ESM) Jason studies cognitive ecology (with studies at genome, individual, and species levels). He is particularly interested in applications for solving wildlife management problems. His website is linked here

Autumn Sabo (BIO - Beaver campus) Dr. Autumn Sabo studies plant ecology, focusing on community dynamics in forest systems. She teaches courses about ecology and environmental science that involve outdoor lessons. In addition to her research and teaching background, Dr. Sabo has also worked in natural resources management. Her website is linked here

Jay Stauffer (ESM) Jay rejoins us as Distinguished Professor of Ichthyology. His research interests include Endangered fishes; freshwater fish behavior; impact of introduced fishes; systematics and zoogeography of freshwater fishes More information here

Shannon Cruz (Communication Arts and Sciences) Shannon studies the determinants, processes, and outcomes of social influence, particularly in environmental contexts. More specifically, she is interested in how environmental attitudes are shaped by ideological factors, change dynamically as the result of social interaction in groups and networks, and can be altered by persuasive messages.

Carolyn Lowry (Plant Science) joined us last spring us as an assistant professor of weed ecology.

Remembering Dr. Edward Bellis

By Jenn Harris

Dr. Edward D. Bellis, a professor emeritus of Penn State's ecology program, passed away on April 5, 2021 in State College, PA at the age of 93. Dr. Bellis chaired the Ecology program chair from 1980-1989 and in his passing our community has lost a great mentor and an influential individual in the shaping of Penn State's ecology program. Dr. Bellis is the namesake of our annual Bellis award given in honor of Dr. Bellis to a current Ecology faculty member for outstanding contribution and dedication to educating and training graduate students in the program.

I spoke to Professor Emeritus, Andy Stephenson, about Dr. Bellis's (or Ed as Andy knew him), accomplishments and character during his career at Penn State. In 1971 Ed was one of a group of about a dozen faculty that formed the Intercollegiate Degree Program in Ecology. Their group united across multiple departments: the College of Agriculture, Anthropology, Biology, Earth and Minerals Science, and Engineering; all likeminded people studying ecology. At the time there was no formula in the country for building an Intercollegiate Degree Program, they were starting from scratch. The program was built with the mind set of joining across fields to find common ground and support, something that Ed trying to cultivate in the program in multiple ways.

During his stint as chair of the Ecology Program during 1980-1989, Ed accomplished several important tasks in forming the program as we know it. First, as a new program without a department home of its own there was initial resistance for ecology students to receive equal support in their home departments. Why should a department offer the same opportunities for funding, office space, lab space for a student that is not technically in their program? This seems like something we take for granted now, but Bellis had to advocate for students to have these needed supports. Part of this tension was that in the early years of the program, rules around how ecology students should be 'counted' towards degrees completed in each program was unclear. The solution was deceivingly simple: count the students twice. A student in the Ecology IGDP who's faculty is housed in Biology counts as a biology student and ecology student, thus could get equal access to resources and opportunities. Ed also advocated for international students during his tenure as Chair. He built collaborations with labs and students in Chile, Iceland, and Mexico creating a program with the international presence we see today. Ed also would go out of his way to find funding for international students if a challenge in their home country created a barrier to degree progress. Ed saw building a diverse program as a strength, and something important to support.

Ed was also responsible for raising the standard for what a doctorate degree in ecology should include, which is important as ecology is a relatively young field. An ecology dissertation should have an expectation of at least one journal publication, likely multiple and should be hypothesis driven. This raised the rigor of the program, but also created a program whose research is designed to be read and to move the field forward.

Ed also was influential in establishing the culture of the program, and Andy could share multiple stories about Ed's humor and community building for students and faculty. The program's common space in the Biology department was the hub point for students and faculty to get access to paper journals, but it became much more. The space became a favorite lunch spot to gather and talk about ecology, new research, or just life. Chances for students and faculty to interact informally and learn from each other was something that Ed sought to create. In this same vein Ed also developed a brown bag lunch seminar series, where faculty and students

would be present on very early-stage research and get feedback on ideas. With this Ed fostered an atmosphere that was collaborative over competitive. This is in the spirit of the ecology program's founding, a broad group of scientists across disciplines banding together to study ecology.

That kind of community has been a little missing for us during the pandemic since we lack the ability to gather and to learn in a way that is spontaneous. We have gotten creative and found ways to connect on slack, teams, and virtual game nights. However, hearing the stories of Ed in the department felt like they came from a far more distant past in our current context. Hopefully, Ed can inspire us to continue the legacy of creating community as a program in many ways.

Ed also had a very full life after Penn State in a second career leading local PA conservation efforts. Cutting across different groups of people to find common interests and ideals was a hallmark of his conservation work in a similar way that it had been in building the Ecology program. For more information see Dr. Bellis's Obituary

The Other Side of Science

By Caleb C. Butler, Ecology Ph.D. Student

Caleb received the NSF-GRFP fellowship in March 2021 for his research on microbial symbionts in coral reefs. The prodigious fellowship has two components of the application a personal essay and a research proposal. In addition to Intellectual Merit proposals are evaluated on their Broader Impacts, essential outreach and education aspects of the proposal. The grant seeks to fund individuals instead of explicit projects. In this short article, Caleb reflects on lessons learned from the application process and challenges to outreach in the sciences.

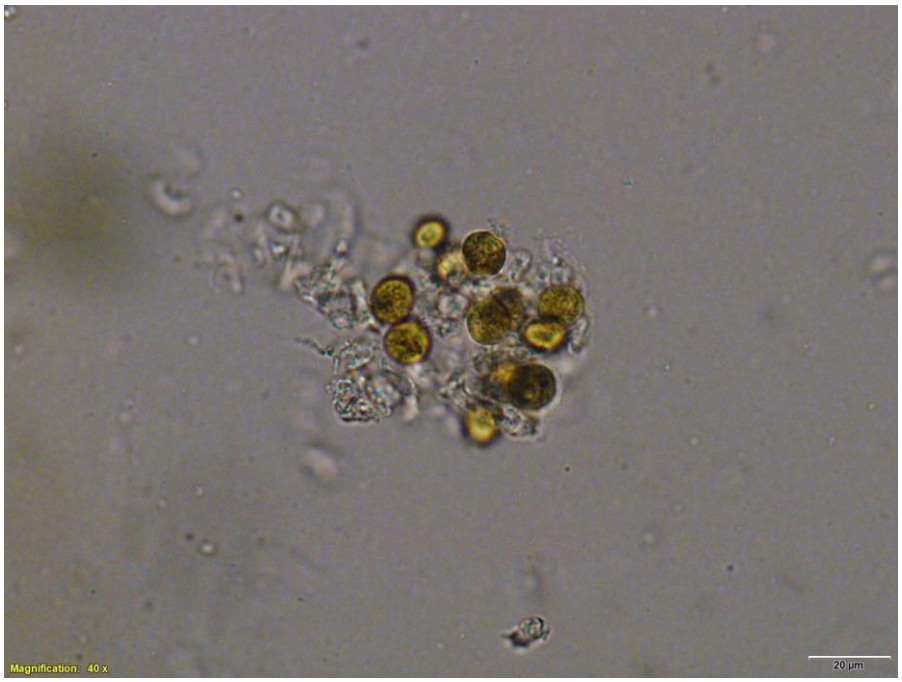


Figure 1. Endosymbiotic microalgae with some host coral cell debris.

I could blather on about symbiotic microalgae and their relationships with coral, but many of you have already heard my spiel on that topic and many more of you will as I make my way further through this program. Instead, I want to talk about the other part of the scientific process: the forgotten art of science communication and outreach.

For some, this is rather controversial. Why commit time that could be spent for research into scientific outreach? Due to the "Publish or Perish" culture that is pervasive across all of academia, this is to no surprise. Tenure is, after all, measured more so by the grants that are awarded and the papers that are produced than by the number of outreach events conducted and views on your sci-comm article or video. It is important for us as scientists to recognize that this culture has contributed to the disconnect between the science community and the general public, creating today's "War on Science". While this is not the sole contributing factor to this mistrust, it is negligent of us to assume we are not contributing to the problem.

This idea was a theme in my background statement for my GRFP submission. I come from a small town in Texas with many faults of its own, including a poorly managed science program where evolution was a blasphemy. During high school, it was only through the newly popular video uploading platform, YouTube, that I was exposed to the possibilities of the science world, igniting my interest. In this, I know that I was not alone. Yes, for some, there are science outreach camps and events that take this place, but these events are not always the most accessible, especially in less privileged communities, thus, making academia seemingly more closed off. If it were not for the efforts of scientists taking time out of their day and uploading short science videos on YouTube, I doubt that I would be here today.

It is with these ideas that I implore you to review your own science outreach and communication plans. While

it is currently not the optimal time for outreach activities, it has never been a better time to get involved in science communication online. With a growing number of young students spending time online, whether it be on YouTube, Twitter, or even TikTok, these are all great media to help conduct science communication. TikTok for example, limits you to a short sixty seconds of video per upload. It doesn't have to be perfect. You don't even need to include any fancy visuals. It just requires your passion for your science, and in a minute, you can be reaching out to hundreds, thousands, or even more users that don't have the privilege of a good public school science program, much like me, when I was younger.

If you have any questions about Science Outreach or need any resources, I recommend that you get in contact with the Eberly College of Science's own Office of Science Outreach here: https://science.psu.edu/outreach

A photo of C. Cornelia Osborne at Exploration-U Bellefonte in 2019. To teach students about different types of symbioses, Chad Fautt developed a "Flappy Bird" game in collaboration with Caleb C. Butler and Chauncy Hinshaw. Chad is planning on publishing the game on a website in the coming weeks.

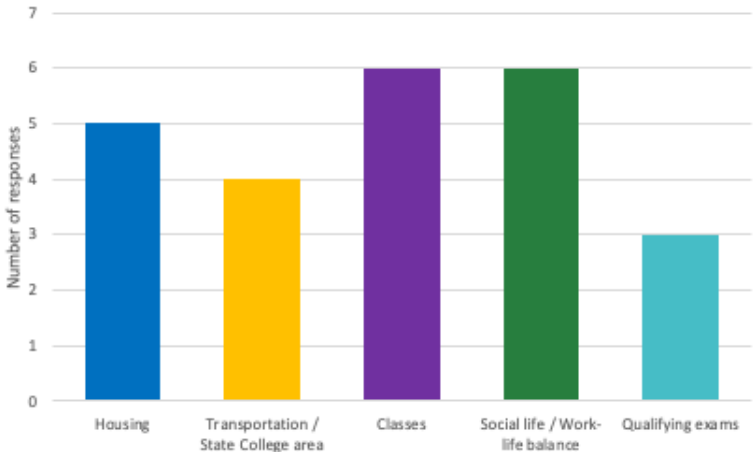
Revamping the Peer Mentoring Program

By Fiona Lunt, Ecology Master's student, Member of the Peer Mentoring committee

The transition into graduate school is, naturally, best understood by graduate students themselves, equipped with a depth and breadth of knowledge that goes far beyond what one can learn by just googling, "What is Penn State like?" Within the trials and tribulations of the graduate's journey, creation of a supportive community of peers is a somewhat of a necessity. Most fall into this network naturally due to shared courses and social events, but there remains a time before new students settle in that the unanswered questions of graduate school can be simultaneously daunting and exciting. The early stages of being a grad student, from initial acceptance all the way through even the first year, consist of being in a new stage of academia, a new location, and a new community. Making this transition is not easy for all, many are hesitant to ask for help, and even the seemingly most trivial questions can be important. How do I find housing? When do I get paid? Where are the best places to eat? What does a qualifying exam look like? To provide even the smallest bit of additional help, the Ecology program is working to revamp its peer mentoring program. The goal is to support to the new cohort of graduate students by leveraging the knowledge, compassion, and enthusiasm of our current students.

For some time now the Ecology program has assigned incoming students a current student to act as their mentor. Last semester (Fall 2020), our newly-formed peer mentoring program committee sent out a survey to gauge the needs for the peer mentoring program. Based on the survey, we learned that while some individuals developed a positive mentor-mentee relationship, many others only had one-way communication. We also found that there was little structure to the existing program and no accountability on mentors for reaching out to their mentees. Overall, the survey revealed that most mentees would like to have someone to ask questions to or at the very least a familiar and friendly face when they first arrive, while mentors would like more guidance on how to interact with structured communications or events. In considering these responses, our committee has been working to transition into a newly-designed program that meets these goals.

Incoming students have a variety of needs and questions, but the end goal is to be both flexible to these needs and provide structured support that makes it easier for mentors to engage. One of the main changes to the program is that folks are no longer randomly assigned– most in the survey agreed that it would be preferable to have a mentor that is in the same home department or building. This is not an ideal system yet, but the hope is that incoming students are assigned a mentor that is in their advisor's department or shares certain desired identifiers, such as being an international student or first-generation. While graduate students can connect over the single shared experience of being here, facilitation a mentor-mentee relationship may be easier if there are other ways to relate to one another. Moreover, pairings with some shared qualities could serve to better answer mentee's specific questions and challenges. We are also providing guidance for mentors in how and when to contact their mentees, which should meet the need for more structure. Over the next year, we hope to see how these changes are impacting the peer mentoring program and will gain new insight into whether it is improving the transition for new students. Current students are clearly empathetic to the needs of incoming students and we are already gathering eager participants hoping to share their knowledge and support. If you know of great graduate school peer mentoring programs or have other ideas for our committee we would love to hear from you (you can email Jason)



Common question categories from students to peer mentors. Data from peer mentor survey conducting in Fall of 2020

Decoding the Language of Plants

By Olivia Trase, 2nd year Ecology Ph.D. Student

Human communication is the most advanced form of communication in the known universe. Humans have evolved hundreds of spoken and written languages and can send messages across vast distances using telephones and now the internet. But what about communication in other organisms? Because of our advanced language and technology, we often overlook the complexities that exist in the communication systems of other species. For example, it has only been a few decades since the early 1980s when we recognized that plants communicate at all[1], and that theory was ridiculed by the scientific community for a long time before finally being accepted. We now know that plants can send and receive messages using volatile signaling, the release of chemical compounds into the air by one plant that disperse and can be 'smelled' and interpreted by another plant. That scent you smell after grass has been freshly cut? That is the grass 'screaming' that it has been attacked, a warning to other grass plants that danger is near. However, despite knowing for years that plants send and receive volatile messages, a full translation of the volatile language does not yet exist.

An experimental setup in the greenhouse capturing plant volatiles, photo by Olivia Trase

Plants are constantly emitting and receiving complex volatile messages that contain dozens to hundreds of compounds at specific concentrations in specific ratios. To further complicate matters, plants are not the only organisms that emit volatiles or use volatile signaling to communicate; insects and microorganisms also use volatile cues to interact with each other and their environment. In fact, because there are so many organisms that use volatile signaling, volatile cues emitted by one organism can be co-opted and exploited by other species for their own benefit. One of the most famous examples of this volatile exploitation occurs when insect parasitoids eavesdrop on plant defensive volatile signals to locate prey which are feeding on the plant[2]. Several experiments have revealed the importance of volatile cues for inter-species and multitrophic interactions, but there have been fewer studies that have been able to show which volatiles or combinations of volatiles are responsible for the signal in question. Current methods include testing single compounds in controlled environments to see whether they elicit the desired response, but knowing about a single compound that is involved in the overall signal is like knowing a single word in a larger, more complex message. During my own Ph.D. work, I have sought to uncover the volatile signals that maize plants use when they are being attacked by

[1] Paul A. Hedin, ed., *Plant Resistance to Insects*, vol. 208, ACS Symposium Series (WASHINGTON, D.C.: AMERICAN CHEMICAL SOCIETY, 1983), https://doi.org/10.1021/bk-1983-0208.

[2] T. C. J. Turlings et al., "Larval-Damaged Plants: Source of Volatile Synomones That Guide the Parasitoid Cotesia Marginiventris to the Micro-Habitat of Its Hosts," *Entomologia Experimentalis et Applicata* 58, no. 1 (1991): 75–82, https://doi.org/10.1111/j.1570-7458.1991.tb01454.x.

western corn rootworm (WCR), a specialist insect herbivore that causes millions of dollars of damage to maize crops each year. WCR eggs overwinter in the soil and then feed on maize roots during their larval stages. Because they feed underground, the larvae are difficult to detect as well as difficult to treat. Currently, treatments include rotation of crops that WCR cannot survive on, genetically modified maize containing *Bacillus* genes which produce WCR-specific toxins, and pesticide use. Because there are no known methods for detecting WCR larvae before irreversible root damage to the plant has occurred, many farmers have resorted to higher pesticide use as a precaution. Therefore, accurate detection and precise treatment of infected plants could be invaluable for future integrated pest management strategies combatting WCR in maize fields. One potential way to detect WCR feeding is through maize root volatile signaling. Researchers have found that when maize roots are attacked by WCR, they release a compound called (*E*)-β-caryophyllene which can in turn attract entomopathogenic nematodes (EPN) to feed on the WCR larvae, another example of volatile signal exploitation[3]. However, many American maize varieties have lost the ability to produce this compound in response to WCR feeding[4], requiring a need for more complex analysis of maize root volatiles in American maize varieties.

In our lab, we have been able to detect and identify dozens of compounds emitted from maize roots, but no single compound has emerged as important for signaling after WCR feeding. It is more likely that there are multiple compounds emitted during larval feeding, and different combinations and concentrations of these compounds produce unique signals. During my Ph.D. I hope to decipher those signals through machine learning. Machine learning algorithms find patterns in complex datasets using advanced statistical methods and are responsible for many of the technological advances we use today like image and speech recognition. Machine learning can provide a means to wade through the mess of volatile compounds we detect to find patterns, as opposed to simply looking at fold changes in singular compounds. While machine learning is a powerful tool, accurate predictions require immense amounts of data. Current methods of collecting root volatiles do not allow for processing more than a few dozen samples a day, so to collect enough data to be able to use a machine learning pipeline will take a significant amount of time. With enough data, machine learning should be able to not only predict the compounds that are important in this plant-herbivore interaction, but also the specific concentrations and combinations of those chemicals. While I am excited by the potential of applying machine learning to my own experimental system, I am also eager to see the application of machine learning in other areas of ecology to further our understanding of the natural world.

[3] Sergio Rasmann et al., "Recruitment of Entomopathogenic Nematodes by Insect-Damaged Maize Roots," *Nature* 434, no. 7034 (April 7, 2005): 732–37, https://doi.org/10.1038/nature03451.
[4] Tobias G. Köllner et al., "A Maize (E)-β-Caryophyllene Synthase Implicated in Indirect Defense Responses against Herbivores Is Not Expressed in Most American Maize Varieties," *The Plant Cell* 20, no. 2 (February 1, 2008): 482–94, https://doi.org/10.1105/tpc.107.051672.

Updates on Diversity, Equity and Inclusion Initiatives and Committees

This is by no means a complete list, but I think there is value in beginning a place to share ideas with each other and the Ecology Program community.

Statements collected by Jenn Harris, Ph.D. student in Ecology

Image credit Andy Brunning/Compound Interest

Ecology Diversity Equity and Inclusion Committee

Contributions from:
***Madeline Luthard**, Ph.D. Student Ecology*

This spring semester, the Ecology Program DEI Committee organized a virtual screening of the documentary, Picture a Scientist, which was attended by ~40 students, staff, and faculty. Following the screening, we hosted a Zoom discussion for a conversation about the film and about gender and equity in the sciences. We also finalized our shared statement of program values related to equity and inclusion and continued the development our strategic plan. Hot off the press, the new statement has just been posted on the Ecology web page here. Looking ahead to the summer and fall, we began planning future events and trainings that complement the work of DEI committees within the various departments that make up our Ecology Intercollege Graduate Degree Program.

Ecosystem Science and Management Diversity Equity and Inclusion Committee

Contributions from:
***David Muñoz**, Ph.D., Research and Equity Specialist*
***Estelle Couradeau**, Ph.D., Assistant Professor of Soils and Environmental Microbiology*
***David Miller**, Ph.D., Assistant Professor of Wildlife Population Ecology*
Department of Ecosystem Science and Management,

Here is a summary the Ecosystem Science and Management DEI committee's accomplishments this year:

- We completed a 4-session workshop on inclusive and equitable curriculum for 6 instructors.
- We offered a workshop entitled "Creating Inclusive Cultures in the Environmental Fields" that was attended by 44 faculty, staff, graduate students, and external partners.
- We offered a workshop titled "Critical and Inclusive Mentoring" for graduate students and post-docs
- We updated and improved our document entitled "Best practices for equitable hiring" focused on faculty searches.
- We are in the midst of the Ecosystem Science and Management's Vision and Planning process. We are putting together our strategic plan for the next 5 years related to DEI.
- We have drafted program level DEI curriculum objectives for the undergraduate and graduate degrees in the program, and we will be finalizing them in the next few months.

Plant Sciences Diversity Equity and Inclusion Committee

Contributions from:
Elsa Sanchez, Ph.D. Professor of Horticultural Systems Management,
***Liana Burghardt**, Assistant Professor Department of Plant Sciences*

During the Spring semester the Plant Science Equity, Diversity, Inclusion committee: 1) welcomed four new undergraduate/graduate student members 2) formalized our Committee procedures, 3) hosted six department-wide EDI trainings led by Dr. Ingram and Dr. Ward that have reached ~ 90 different department members, and 4) organized a virtual beverage hour after department seminar to foster belonging and connect new students, faculty, and staff with the existing departmental community. We are also working on finalizing our mission statement and strategic plan while laying the groundwork for inclusive teaching and departmental benchmarking initiatives.

Department of Biology's Diversity and Inclusion Committee

Contributions from:

***Mathew Ferrari**, Ph.D., Committee Chair, Associate Professor of Biology*

The focuses of our committee this year have been:

1. Writing a mission statement (embarrassingly, we never had one)

2. Planning post-doctoral training/professional development activities — we are working on one to share "lessons learned" about mentoring and lab management in the virtual environment (hoping that we're not doing that for much longer, but it's still good for working with remote colleagues/mentees) and one on effective use of social media for professional development (this is a nascent idea and we have been looking for partners across campus that might be better equipped to deliver this).

3. We are now working on a proposal in response to the new ECoS DEI seed grant RFP.

Inclusion, Diversity, and Equity in Anthropology

Contributions from:

Laura S Weyrich, Ph.D., Associate Professor of Anthropology

The Department of Anthropology formed the IDEA - Inclusion, Diversity, and Equity in Anthropology - Committee in 2020, which is composed of representatives from all members of the department, including professors at each level, staff, teaching faculty, students, and researchers. This semester, the group is mostly waiting to hear back about a grant to determine future projects.

Awards and Publications[5]

Congratulations to:

Christina Grozinger receives National Academy's Prize in Food and Agriculture Sciences

Jason Kaye named distinguished professor

Erica Smithwick named distinguished professor

Sarah Isbell received the Alumni Association Outstanding Dissertation award

Elyse McMahon for receiving the Graduate School Endowed Fellowship

Caleb Butler for receiving the NSF-GRFP fellowship

Jessica Elaine Brown, **Trevor Drees**, **Emily Gagne** NSF-GRFP honorable mentions

Margarit López-Uribe received an NSF CAREER award

Lin, P. A., Chen, Y., Chaverra-Rodriguez, D., Heu, C. C., Zainuddin, N. B., Sidhu, J. S., ... & Felton, G. W. (2021). Silencing the alarm: an insect salivary enzyme closes plant stomata and inhibits volatile release. New Phytologist.

Jones, J. H., Pisor, A. C., Douglass, K. G., **Bird, R.** B., Ready, E., Hazel, A., ... & Towner, M. C. (2021). How can evolutionary and biological anthropologists engage broader audiences?. American Journal of Human Biology, e23592.

Yates C†, Guo J†, **Bell TH,** Fleishman S, Bock H, **Trexler RV**, **Eissenstat D, Centinari M**. 2021. Tree-induced alterations to soil properties and root-associated microorganisms following 23 years in a common garden. *Plant and Soil* doi.org/10.1007/s11104-021-04846.
† authors contributed equally

Marks-Block, T., Lake, F. K., **Bird, R. B.,** & Curran, L. M. (2021). Revitalized Karuk and Yurok cultural burning to enhance California hazelnut for basketweaving in northwestern California, USA. Fire Ecology, 17(1), 1-20.

Bjornstad, O. N., Shea, K., Krzywinski, M., & Altman, N. (2021). Author Correction: The SEIRS model for infectious disease dynamics (Nature Methods,(2020), 17, 6,(557-558), 10.1038/s41592-020-0856-2). Nature methods.

Cooch, E. G., Alisauskas, R. T., & **Buderman, F. E**. (2021). Effect of Pre-Harvest Mortality on Harvest Rates and Derived Population Estimates. The Journal of Wildlife Management, 85(2), 228-239.

Pizo, M. A., Morales, J. M., Ovaskainen, O., & **Carlo, T. A.** (2021). Frugivory specialization in birds and fruit chemistry structure mutualistic networks across the Neotropics. The American Naturalist, 197(2), 236-249.

Fleishman, S. M., Bock, H. W., **Eissenstat, D. M.,** & **Centinari, M.** (2021). Undervine groundcover substantially increases shallow but not deep soil carbon in a temperate vineyard. Agriculture, Ecosystems & Environment, 313, 107362.

Hed, B., & **Centinari, M**. (2021). Gibberellin Application Improved Bunch Rot Control of Vignoles Grape, but Response to Mechanical Defoliation Varied Between Training Systems. Plant disease, 105(2), 339-345.

WL King†, **Yates C**†, Guo J, Fleishman S, **Trexler RV, Centinari M, Bell TH, Eissenstat D.** Accepted. The hierarchy of root branching order determines bacterial composition, microbial carrying capacity, and microbial filtering. *Communications Biology*
† authors contributed equally

Portell, X., Sauzet, O., Balseiro-Romero, M., Benard, P., Cardinael, R., **Couradeau, E**., ... & Vidal, A. (2021). Bypass and hyperbole in soil science: A perspective from the next generation of soil scientists. European Journal of Soil Science, 72(1), 31-34.

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[5] Publications from Google scholar August-December. Only in included if a Penn State Ecology Faculty 1st through 4th author or Last author. Sorry if anyone was missed!

Kammerer, M., Goslee, S. C., Douglas, M. R., **Tooker, J. F**., & **Grozinger, C. M**. (2021). Wild bees as winners and losers: Relative impacts of landscape composition, quality, and climate. Global change biology, 27(6), 1250-1265.

Calovi, M**., Grozinger, C. M., Miller, D. A**., & Goslee, S. C. (2021). Summer weather conditions influence winter survival of honey bees (Apis mellifera) in the northeastern United States. Scientific reports, 11(1), 1-12.

Isbell, S. A., Bradley, B. A., Morris, A. H., Wallace, J. M., & **Kaye, J. P**. (2021). Nitrogen dynamics in grain cropping systems integrating multiple ecologically based management strategies. Ecosphere, 12(2), e03380.

White, C. M., Finney, D. M., **Kemanian, A. R.,** & **Kaye, J. P.** (2021). Modeling the contributions of nitrogen mineralization to yield of corn. Agronomy Journal, 113(1), 490-503.

Hunter, M. C., **Kemanian, A. R.,** & Mortensen, D. A. (2021). Cover crops and drought: Maize ecophysiology and yield dataset. Data in Brief, 35, 106856.

Shaw, C. L., & **Kennedy, D. A.** (2021). What the reproductive number R0 can and cannot tell us about COVID-19 dynamics. Theoretical Population Biology, 137, 2-9.

Hinshaw, C., Evans, K. C., Rosa, C., & **López-Uribe, M. M.** (2021). The role of pathogen dynamics and immune gene expression in the survival of feral honey bees. Frontiers in Ecology and Evolution, 8, 505.

Milholland, M. T., Eisen, L., Nadolny, R. M., Hojgaard, A., **Machtinger, E. T**., Mullinax, J. M., & Li, A. Y. (2021). Surveillance of Ticks and Tick-Borne Pathogens in Suburban Natural Habitats of Central Maryland. Journal of Medical Entomology.

Wolfkill, J., Bejarano, M. E., Serfass, T. L., Turner, G., Brosi, S., Feller, D., & **Mahan, C. G**. (2021). The Prevalence of the Raccoon Roundworm, Baylisascaris procyonis, in Allegheny Woodrat Habitat in the Mid-Atlantic Region, USA. The American Midland Naturalist, 185(1), 145-147.

Amburgey, S. M**., Miller, D. A.,** Rochester, C. J., Delaney, K. S., Riley, S. P., Brehme, C. S., ... & Fisher, R. N. (2021). The influence of species life history and distribution characteristics on species responses to habitat fragmentation in an urban landscape. Journal of Animal Ecology, 90(3), 685-697.

Rork, A. M., Xu, S., Attygalle, A., & **Renner, T.** (2021). Primary Metabolism co-Opted for Defensive Chemical Production in the Carabid Beetle, Harpalus pensylvanicus. Journal of Chemical Ecology, 1-16.

Miller, A. D., Inamine, H., Buckling, A., Roxburgh, S. H., & **Shea, K.** (2021). How disturbance history alters invasion success: biotic legacies and regime change. Ecology Letters, 24(4), 687-697.

Baiz, M. D., Wood, A. W., Brelsford, A., Lovette, I. J., & **Toews, D. P**. (2021). Pigmentation Genes Show Evidence of Repeated Divergence and Multiple Bouts of Introgression in Setophaga Warblers. Current Biology, 31(3), 643-649.

Wei, H., Tan, S., Li, Z., Li, J., Moural, T. W., **Zhu, F.,** & Liu, X. (2021). Odorant degrading carboxylesterases modulate foraging and mating behaviors of Grapholita molesta. Chemosphere, 270, 128647.

Zimmerer, K. S., Vaca, H. L. R., & Sahonero, M. T. H. (2021). Entanglements of agrobiodiversity-food amid cascading migration, coca conflicts, and water development (Bolivia, 1990–2013). Geoforum.

Spotlight on State College Nature

As it starts to warm up in State College, I think it is a great opportunity to embrace our inner naturalist. Noticing fauna and flora while on walks, bikes or commutes is fun way to destress and experience ecology in a pure and simple form. Here are just a couple sightings from local area. Not all of these flora or fauna are identified so if you spot something you know please reach out to me at jeh6121@psu.edu.

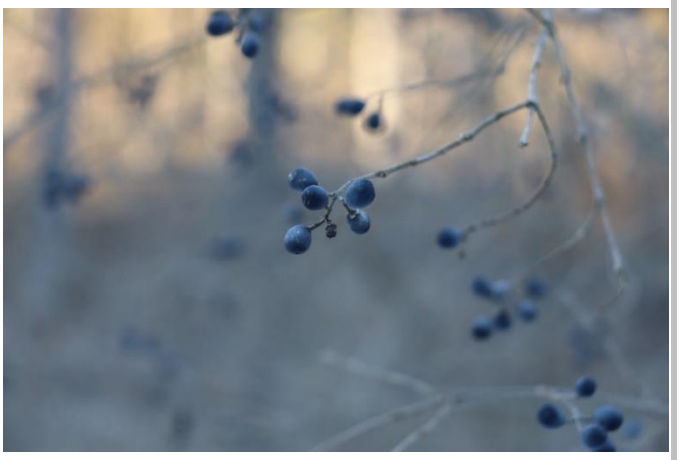
White hickory tussock moth caterpillar spotted in Rothrock forest PC Jenn Harris

Unidentified Fungi growing on a tree in in State College, PC Uma Crouch

Unidentified fungi in State College, potentially turkey tail polypore PC Sarah Richards

Chlorociboria Aeruginosa found in rothrock forest PC Sarah Richards

Unidentified fungi in state college, PC Sarah Richards



Privet berries in Spring Creek Canyon, PC Lilly Leak

Potentially trametes cinnabarina Spagnum in the state college area photo by Gina Bledsoe

Unidentified fungi in state college, PC Uma Crouch

Ink cap mushroom found in State College PC Liana Burghardt

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U.Ed. GRD21-15