



NOTES FROM THE FIELD

The Biannual Newsletter of the Intercollege Graduate Degree Program in Ecology
The Pennsylvania State University



Photo contributions from Madalyn Meyers, Sarah Rothman, Dominika Dec Peevey, Sara Mueller, Vishnu Sankararaman, Noah Winters, Elyse McMahan, Monique Pipkin and Braulio Assis.

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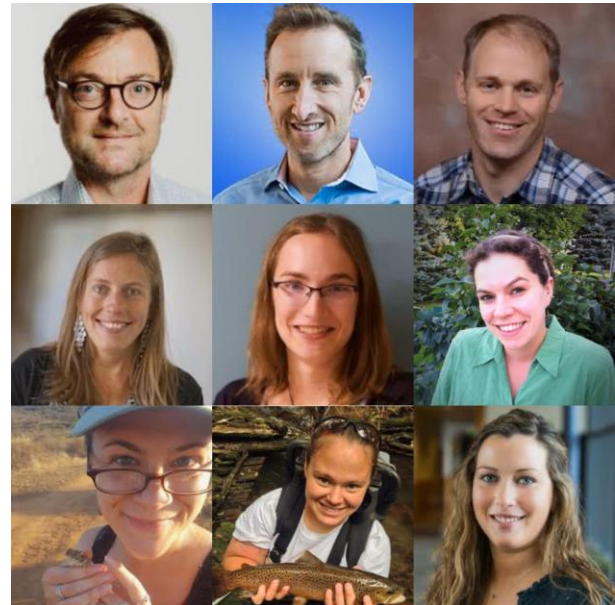
WHO WAS BRIAN HORTON?

By: Elyse McMahon

Many within the Ecology Program have heard of the J. Brian Horton Memorial Award. The award recognizes the outstanding achievements and service to the graduate community by a student in the Ecology Program. According to the Ecology Program's website, the award is a memorial to J. Brian Horton who was a graduate student in the Ecology program and "went above and beyond his excellence in scholarship and research, was an untiring source of advice, help, collaboration, and inspiration to his fellow students and to faculty members." However, many of us do not know who Brian was and exactly how he became such a well-known name in the program. I had the opportunity to interview people who knew Brian and learn just how important he was to so many during his time at Penn State.

Brian came to Penn State from MIT where he studied mathematics and programming. He worked with Dr. Ted Williams who was in the Biology Department and was a former chair of the Ecology Program. In Dr. Williams' lab, Brian studied how competitive interactions would change with micronutrients, especially molybdenum. "He did experimental and mathematical modeling of populations," says Dr. Bernie Devlin, a close friend of Brian's. "I believe he enjoyed it immensely, although it was never easy, and he was never satisfied with his results." Of course, as a PhD student, struggling to create innovative research, who is? In addition to his own research, Brian helped many others with their modelling and statistics since many times, the programs or models were not suited to the diversity of research done in the Ecology program. Dr. Steven Juliano, another one of Brian's friends, told me a story of how Brian helped him in creating a new predation model. "I was interested in predation and at one point was interested in this insect that has the ability to feed on one prey item and catch others at the same time. Most of the models of predation assume that while a predator is eating, it can't be catching more prey and this insect violates that model. Brian, being the mathematical guy that he was, noted that there was a body of mathematical theory called Queueing Theory that deals with how servers process customers through lines and suggested that might be a way to model how this predator acts. So, I followed up with that and ended up writing a paper about this using Queueing Theory to analyze what was predicted for this predator. That paper wasn't finished or published until after Brian died, but it was dedicated to him because he gave me that idea."

Dr. Devlin also told me a wonderful story of how Brian helped him with his research. "One day I posed to Brian this question: If I could capture an image of *Lobelia cardinalis* seeds, could they be quantified on a scanner. He looked at me a little embarrassed – apparently, it was a silly question – and said of course it could. Ok, I agreed, of course it could, but the program was beyond my skills



Some past recipients for the Horton Award; Gregory Keller, Matt Ferrari, Joseph Dauer, Glenna Malcom, Gail McCormick, Erynn Maynard, Staci Amburgey, Shannon White and Madalyn Meyers

at the time. For Brian, however, it wasn't. He had worked on image processing in an earlier life. So, within 24 hours, Brian gave me a working program to quantify the number of seeds on an image, even if they touched one another. Next, I wanted a way to characterize the number of seeds per capsule that was independent of the weight of all the seeds in the capsule. Still, how do you capture an image of the seeds? Brian and I mulled this over and came up with the simple idea of spreading a capsule's worth of seed on an acetate sheet and photocopying it. The Department tolerated me using the photocopier to characterize seeds, Ted Williams tolerated me using his scanner, and Brian tolerated me in the lab yet again. The fun part was hanging in the lab, I can't say the work was a joy. It was a joy, however, to be the first person, at least to my knowledge, to have quantified production of pollen and seed to such detail from individual flowers and plants and to use these data to answer questions regarding plant reproductive ecology. I owe a lot to Brian for that joy."

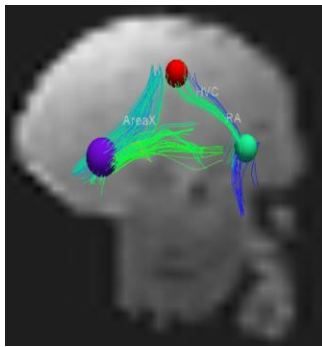
Besides work, Brian loved to run with other graduate students including Dr. Devlin, Dr. Jim Miller and Dr. Malcom Frisbie. "It was the popular thing to do back then. It seemed like everyone picked up running at the time." Dr. Andy Stephenson mentioned. "He would also attend the weekly Brown Bottle Seminars, which was a fun way to interact with everyone in Ecology and other departments," Dr. Victoria Borowicz said. "He was not really gregarious, but he had very good friends," she continued. He also frequented the Brown Bag Seminar the Ecology graduate students had started. "During one of those Brown Bag Seminars is how Brian and I started discussing my problem with my predation model," Dr. Juliano mentioned. "He had ideas that others never thought of," he continued. Brian presented at one of the Brown Bag seminars on his research with molybdenum. Both Dr. Bellis, the chair of the program at the time, and Dr. Stephenson recounted this comical story. "He was giving his brown bag on how he was going to bury molybdenum," Dr. Stephenson said. "If you say it fast, it's very hard to say. He couldn't pronounce it very well. No one could," recounts Dr. Bellis. "He started stumbling over the word and then about halfway through, every time he would put up the Mo (short for molybdenum) he would say cobalt." Dr. Stephenson said with a chuckle. "Everyone knew what he was talking about, but it got him through the lecture, and it was pretty funny," said Dr. Bellis. "During the question and answer, people were trying to get him to say molybdenum more times," said Dr. Stephenson. It sounded like quite a funny experience that I'm sure others still think about.

After Brian passed, Dr. Ted Williams along with Dr. Bellis spearheaded the movement to start a fund to commemorate him. "People were quite moved by the situation...It was to commemorate him. It was still pretty fresh after his death. I think the first person to get the award was Jim Miller, one of Brian's friends," Dr. Borowicz said. It seemed to be a bit of an uphill battle to establish the award since there were many hoops to jump through, recounted from both Dr. Bellis and Dr. Stephenson. "They went out; the grad students, the faculty, everyone chipped in and they met the goal and raised the money for the scholarship," said Dr. Stephenson. "The award in his honor is on the mark: 'an untiring source of advice, help, collaboration, and inspiration to his fellow students and to faculty members.' I couldn't agree more," said Dr. Devlin. "It would have been great to see where he went," mentioned Dr. Juliano. Unfortunately, we don't know what Brian's plans were after he finished here at Penn State, but I think this award is a wonderful way to celebrate and think about how Brian's influence helped so many and his memorial is still helping others today.

BRIDGING THE GAP BETWEEN ECOLOGY AND NEUROSCIENCE – AN UPDATE FROM THE BARTELL LAB

By: *Madalyn Meyers*

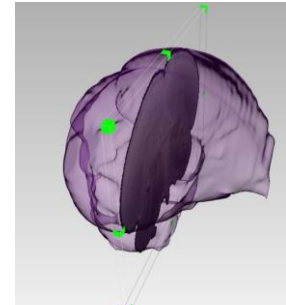
Members of the Bartell Lab like to refer to themselves as Eco-neuro-physiologists. Work completed in the lab focuses on questions surrounding songbird migration, a seasonal behavioral state in which songbirds replace normal sleep hours with prolonged flight activity. This disruption of the normal sleep-wake cycle means that the migrating state in songbirds is accompanied by extreme sleep-debt. While this may seem counterproductive to their fitness potential at first glance, this behavior is vitally important for the avian class and allows them to complete this energetically demanding ritual with optimal temperature, wind and predator-free flying conditions. This state is also differentiated from typical sleep-deprived conditions in that migrating songbirds display no



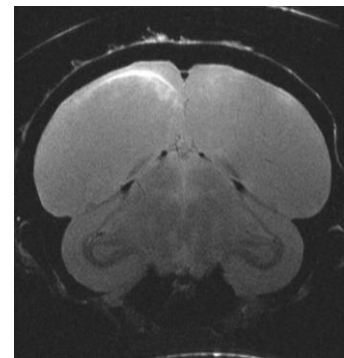
DTI Image of White Throated Sparrow brain showing neural projections of the song control circuit.

cognitive or physical deficits which are widely associated with sleep deprivation across the rest of the animal kingdom. Roughly twice a year, birds naturally enter the migratory state while in captivity under constant environment conditions, displaying nocturnal restless activity while trying to migrate in their confined environment. In contrast, this state is naturally synchronized to the appropriate time of year in the wild through changing daylengths and temperatures, highlighting the existence of an internal, annual clock that can be entrained through appropriate external input to the system. Unfortunately, the two most important synchronizers for migratory initiation, perceived daylength and temperature, are anthropogenically altered by factors of light pollution and global climate change, leaving scientists to speculate the sensitivity of migratory initiation with changing global conditions.

Historically, both rising temperatures and intensity of light pollution are associated with positive degrees of variations in migratory initiation date. However, the degree to which these environmental factors affect the unique songbird protection to sleep debt is largely unexplored, with the protective mechanism responsible for this resistance remaining illusive. If our goal is to protect the integrity of this vital seasonal phase, then our understanding of the physiological drivers behind the creation of migratory behavior must be developed in order to understand the observed environmental impacts and to advise informed conservation decisions. In the pursuit of this knowledge, the Bartell Lab has gone where few ecologists have gone before them, and have developed protocol to obtain Magnetic Resonance Images (MRI) and Diffusion Tensor Images (DTI) on the White Throated Sparrow to compare neuronal cluster density and direction information between the migratory and non-migratory states. Here, we can identify any deviations of activity throughout the many interconnected neural pathways in the brain which influence behavior, all of which are susceptible to changes through environmental variables.



Coronal cross section slice selection on White Throated Sparrow brain MRI.



MRI coronal cross section of a White Throated Sparrow brain.

Throughout this process, special attention is paid to the regions involved in sleep-wake regulation and arousal. This information may prove valuable for discovering the distinctive neurophysiological properties of a migrating songbird and bringing us one step closer to the understanding and protection of the avian class.

A SHORT REFLECTION ON THE SPRING 2020 ECOLOGY SEMINAR SERIES

By: Fiona Lunt

This semester we were fortunate to have five speakers from academia and beyond present talks surrounding the theme of “conservation ecology.” We chose this theme because of its broad applicability to a majority of ecologists and because it is actively multidisciplinary. Conservation ecology has the ability to link multiple sub-fields of ecology with both breadth and depth of research, and we ended up having talks that touched on topics like international wildlife trade, the connection between forest structure and food security, and finding the bridge between scientific research and art. And while my descriptions of these talks may not do them justice, I can attest to their ability to all link the underlying theme of the series— conservation of animals, plants, food, resources and more. We were lucky to present this theme to the program because conservation underscores our work and is often the justification for why ecological research is so important.

Despite this semester’s seminar series being somewhat short-lived, we still saw a continual increase in attendance, an abundance of questions for the speakers, and engaging post-lecture conversation over some ravenously consumed refreshments. These indicators emphasize how important seminars series such as this are for faculty and students alike. They provide exposure to topics that may sometimes seem distant from our own research but end up reminding us of connections across our field. Ecology is rooted in connections— biotic and abiotic, global and local, theoretical and applied, human and not-so-human. Seminar allows us to take a moment on a Friday afternoon and remind ourselves of the directions this field can take, what it means to each individual, and to just learn something new. This semester we focused on providing talks that were as beneficial and appealing as possible to a program that is spread across so many departments, and our speakers ended up doing an overall wonderful job connecting with the variety of research perspectives in the audience. Thanks to technology, we will be able to host our last two seminars via Zoom which will allow everyone to participate and continue to learn from these experts.

What we got to hear this semester:

-Feeling the burn: The optimal timing of prescribed fires for recreational benefits- Katherine Zipp, Penn State

-Addressing Alaska's environmental challenges through microbial, plant, and human community building- Mary Beth Leigh, University of Alaska Fairbanks

-Deadly Markets: Ecological and Social Issues Related to the International Trade in Wildlife- David Wilcove, Princeton University

-Tropical forests and their role in food security: mapping patterns and change- Sarah Gergel, University of British Columbia

-Shortfalls for the sensitive: Policy and management to conserve US endangered species under climate change- Jennie Miller, Defenders of Wildlife

EGSO YEARLY UPDATE

By: Makaylee Crone

Your Ecology Graduate Student Officers are excited to update you on what we have done so far and plans for the coming year. The 2020-2021 officers are Makaylee Crone (president), Amy Wroblewski (vice president), Laura Jones (curriculum representative), Maisie Macknight (secretary), Emily Gagne (program committee representative), Fiona Lunt (Anderson award rep), Jim Lor (webmaster), Olivia Trase (co-social chair), and Chad Fautt (co-social chair). This year's officers have been focused on increasing service to the community and connections between cohorts.

We would like to increase community involvement by dedicating our yearly project to community service. We are currently in the process of adopting a highway, which will bring the Ecology Program together at least twice a year for clean up events. PennDOT will provide us with hazard vests, gloves, trash collection services, and roadway caution signs. This is something we are very passionate about, and we encourage you and your families to come to cleaning events to help out! If cleaning events are well received, there is also the possibility of joining the Adopt and Beautify program to plant native and pollinator friendly plants on our stretch of roadway. EGSO has also decided to have another Millbrook Marsh cleaning event at the 2020 Fall picnic. We hope that the rest of the program is as excited about these projects as we are.

In addition, we have come to notice that there is not enough connectivity between ecology cohorts. Most cohorts have social events within their own groups, but there is less communication across cohorts. This has inspired co-social chairs Olivia Trase and Chad Fautt to create a slack group for all ecology students. Within this group, there are channels for students with particular interests, such as rock climbing and board games. Slack has also helped increase student attendance at monthly happy hours and game nights.

In addition, EGSO is planning our yearly retreat to bring students together across the program. Surprisingly, even fundraising for the retreat will bring students closer together. Students plan to have a bake sale at the end of April to raise funds. This bake sale will be unique in that students will bake together in groups and deliver ordered treats directly to your office! Keep an eye out next month for an email with the ordering form.

As always, EGSO appreciates the support offered by faculty and staff. We would like to say thank you for everything you do to keep the program running smoothly. We look forward to the coming year and hope you can join us for all the fun activities we have planned!



HOW ARE YOU COPING WITH DISTANCING DURING THE COVID-19 PANDEMIC?

By: Elyse McMahon

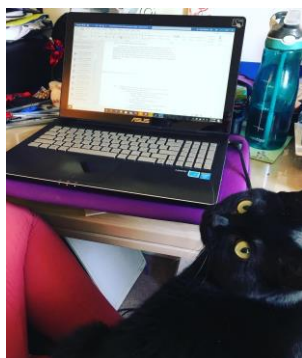
Everyone in the world has been impacted by the COVID-19 pandemic. Some areas in the world much sooner, than others. Currently, most of Penn State is “social distancing” and begin working from home. How are people coping with working from home though? I sent a questionnaire out to the Ecology Program to gain insight into how others are fairing during these uncertain times.

In terms of research, not many seem to be impacted at the moment from the answers I received. Some students came up with innovative ways to keep their projects going. Most students have transitioned to writing projects or computer work. For example, Curt McConnell is now working on simulation modelling instead of the lab work planned. Dr. Erica Machtinger is finishing up several manuscripts. Fiona Lunt is getting her first draft of her proposal draft done. Miranda De Priest said she is working on her coding skills and getting much better. She is also working on a fun new project. “Since being moved out of the lab, I’ve been inspired to look at the Earth Microbiome Project dataset to look for super generalists! What kinds of bacteria can live in the soils of vastly different biomes across the world? What kinds can quickly switch from aquatic to soil to host environments?” she said. However, others are struggling to stay on their schedule because the quarantine has caused delays. Amy Wroblewski said she’s at a bit of a standstill with her work since she is doing field research. Lauren Onofrio had part of her field work delayed as well. “Many of us are waiting to see if we will be able to complete our field work, and it seems likely we will have to cram a summer’s work of field work into a few weeks at the end of the season,” said Dr. Jason Kaye. Everyone in the survey said, the most important thing is to have balance between working and relaxing.

On the positive side, many say their pets are ecstatic to have them home all the time! “They love it!” said Dr. Machtinger, “We have three Bengal cats (which require a lot of interaction) and the two younger girls are just having a blast.” Maddie Meyers said, “Charlie loves having me home all day, and the sun-room is also his favorite room in the house, so I think he also enjoys having it open all day. He is used to having my husband home all day, so he is pretty good about keeping to himself during the day and not distracting us,” said Maddie Meyers. For me personally, my cat, Nikita, is thrilled that I’m home all day. She curls up in my lap while I sit at my desk writing or reading. She has appeared in some Zoom meetings, which is always a crowd pleaser. Makaylee Crone said, “My dog, Muffin, absolutely loves that I’m home all day. She gets a lot more outside time now.” Some said that their pets sense the stress that they are under so are very attuned and keep them company while they work on their computers all day.



Maddie Meyer's dog, Charlie.



Elyse McMahon's cat, Nikita

Besides pets, how else are people keeping themselves busy during this time? There were a range of answers for this question, some enjoy doing puzzles, learning how to embroider, pressing flowers and knitting. Others have been watching classic movies and TV shows like Buffy the Vampire Slayer, watching all the Star Wars movies in chronological order or all the Marvel movies. One of the most common answers was getting outside to do some sort of gardening, which many didn't have the time for before. Others are getting outside and exercising while some are finally catching up on those home projects they have put off for too long. "To stay sane at the end of a long day of zoom classes and meetings, I have to get outside. I have been bike riding and dog walking more than ever. I feel so grateful

that we live in a place where we can easily get outdoors without compromising safety," said Dr. Jason Kaye

And finally (and in my opinion the most important) question asked: what are your go-to snacks while working from home? Reading these responses made me want to go to my own kitchen and start snacking, so read at your own risk! The most common one was popcorn. Other favorites were apples, chocolate covered nuts, peanuts, cookies, flavor-blasted goldfish and Godiva dark chocolate with sea salt. Some interesting snacks came up too. Maddie Meyers mentioned she enjoys, "TwoGood Greek Yogurt with Pina Colada Granola. I also take some extra time in the morning to make my favorite breakfast which is avocado toast with whole wheat sourdough bread, topped with two fried eggs and some everything but the bagel seasoning. Literally life changing." Fiona Lunt had the most interesting response with "these amazing jerk seasoned plantain chips from Trader Joes." I think we will have to try those on the next food run!

I think due to these current situations in the world, it has made us slow down and enjoy the little things we took for granted before. It has also given us more time to do things we didn't have to for before. From this article, I hope you got a little laugh, if not a smile and see that we are all in the same boat, but making the best out of a difficult time.

At the end of this newsletter, I included a fun little activity! Don't know what to do during the day? Simply print out the last page, cut out the wheel and arrow. Line up the circles and with either a pen, pencil, pin, or a tac, attach them together. Spin the Wheel of Choices and do whatever it says. Disclaimer: if the arrow continues to land on "Eat a Snack" don't overthink it, it's fate telling you that you need a snack. Enjoy, stay safe, stay healthy and wash your hands!

Award and Publications

Congratulations to:

Caylon Yates and **Laura Jones** who received the prestigious GRFP fellowships, and **Jim Lor** who received an Honorable Mention for his application.

Amburgey, S. M., Miller, D. A., Brand, A., Dietrich, A. E., & Grant, E. H. C. 202). Factors Facilitating Co-occurrence at the Range Boundary of Shenandoah and Red-Backed Salamanders. *Journal of Herpetology*, 54(1), 125-135.

Bell, T. H., Trexler, R. V., Peng, X., Huntemann, M., Clum, A., Foster, B., ... & Mukherjee, S. 2020. Metatranscriptomic Sequencing of a Cyanobacterial Soil-Surface Consortium with and without a Diverse Underlying Soil Microbiome. *Microbiology Resource Announcements*, 9(1).

Guo, J., Gao, Y., **Eissenstat, D. M.,** He, C., & Sheng, L. 2020. Belowground responses of woody plants to nitrogen addition in a phosphorus-rich region of northeast China. *Trees*, 34(1), 143-154.

Hu, Tianxiao, Hao Zheng, Chen Liang, Sirou Zhu, **Natalie Imirzian,** Yizhe Zhang, Chaoli Wang, **David P. Hughes,** and Danny Z. 2020. Chen. "AntVis: A web-based visual analytics tool for exploring ant movement data." *Visual Informatics*.

Smeglin, Y. H., Davis, K. J., Shi, Y., **Eissenstat, D. M., Kaye, J. P., & Kaye, M. W.** 2020. Observing and Simulating Spatial Variations of Forest Carbon Stocks in Complex Terrain. *Journal of Geophysical Research: Biogeosciences*, 125(1),

Reed, W. P., & Kaye, M. W. 2020. Bedrock type drives forest carbon storage and uptake across the mid-Atlantic Appalachian Ridge and Valley, USA. *Forest Ecology and Management*, 460, 117881.

Reinke, B. A., Hoekstra, L., Bronikowski, A. M., Janzen, F. J., & **Miller, D.** 2020. Joint estimation of growth and survival from mark-recapture data to improve estimates of senescence in wild populations. *Ecology*, 101(1), e02877.

Tylan, C., Camacho, K., French, S., Graham, S. P., Herr, M. W., Jones, J., **McCormick, G. L.,** O'Brien, M. A., **Tennessen, J. B.,** Thawley, C. J., Webb, A., & **Langkilde, T.** 2020. Obtaining plasma to measure baseline corticosterone concentrations in reptiles: How quick is quick enough? *General and Comparative Endocrinology*, 287, [113324].

Vaudo, A.D.; Tooker, J.F.; Patch, H.M.; Biddinger, D.J.; Coccia, M.; **Crone, M.K.;** Fiely, M.; Francis, J.S.; Hines, H.M.; Hodges, M.; Jackson, S.W.; Michez, D.; Mu, J.; Russo, L.; Safari, M.; Treanore, E.D.; Vanderplanck, M.; Yip, E.; Leonard, A.S.; **Grozinger, C.M.** 2020. Pollen Protein: Lipid Macronutrient Ratios May Guide Broad Patterns of Bee Species Floral Preferences. *Insects*, 11, 132.

Wallace, J., **Isbell, S.,** Hoover, R., Barbercheck, M., **Kaye, J.,** & Curran, W. 2020. Drill and broadcast establishment methods influence interseeded cover crop performance in organic corn. *Renewable Agriculture and Food Systems*, 1-9. doi:10.1017/S174217052000006X

White, S. L., DeMario, D. A., Iwanowicz, L. R., Blazer, V. S., & **Wagner, T.** 2020. Tissue Distribution and Immunomodulation in Channel Catfish (*Ictalurus punctatus*) Following Dietary Exposure to Polychlorinated Biphenyl Aroclors and Food Deprivation. *International Journal of Environmental Research and Public Health*, 17(4), 1228.

The Wheel of Choices

