



Welcome!

Hello everyone, welcome to the 2021 Organismal Biology & Ecology newsletter! 2020 has certainly been a challenge for all, so we hope this newsletter reminds you of the OBE community and lets you know that we are thinking of you all.

We're extremely grateful to all of our faculty who have worked tirelessly to adapt their traditional experiential-based learning courses into entirely online formats. Our students have kept open minds and persevered through countless Zoom lectures while still actively participating. As alumni and current students, we know that staring at computer screens isn't what any of us think of when we look back on our OBE courses, so we look forward to better days to come where we can once again convene for in-person discussions, labs, field trips, and be able to embrace experiential learning all together.

Thank you to all – faculty, staff, students, and alumni – who took the time to share your thoughts with me so we could make this newsletter happen. I loved hearing from everyone and enjoyed putting this together; I hope you enjoy it too!

– Olivia Noonan

Letter from the Chair: Shane Heschel

Greetings alumni and students! We hope you are all doing well and that you will enjoy the enclosed information about the Organismal Biology and Ecology faculty, staff, students, and other alumni. This past year has been a challenge for all of us and OBE is no exception - with the hard work of our staff and faculty, we retooled all of our classes for remote and hybrid learning - I am proud to say that OBE offered great classes this year despite the pandemic, continuing to provide the intellectual connections between students and faculty that are a hallmark of our classes. I am honored to work with such a great group of teachers and scholars, and am excited about what the future holds for OBE. The faculty and students of OBE were highly active in research this year, working on a wide variety of projects around the globe - with the help of our wonderful staff and our departmental commitment to student-

faculty interactions, we continue to provide great research experiences for our students. This research, which ranged from orchid phylogeny to mosquito pesticide resistance to bromeliad life-history to pollinators and climate change to water relations of seedlings to the effects of climate on owl life-history and ecology, is a testament to the hard work and quality of the OBE faculty, staff, and students.

The research could not have happened without the support of CC alumni to funds such as the Kelso Fund, Enderson Fund, and the Hevey Fund & OBE is extremely grateful for the continued support of our donors, such as CC graduates, Rob Hevey and Dr. Sharon Smith. Two professors, Jim Ebersole and Marc Snyder, retired this year. We thank them both for their amazing work with students in ecology classes here and abroad as well as their support of student research for many years. Finally, it was with a heavy heart that we said goodbye to professors Jack Carter and Werner Heim - two amazing teachers who continued to contribute to OBE long after their retirements from CC.

Faculty and Staff Updates

Rachel Jabaily

I celebrate the great work of four OBE seniors who completed theses with me – Leah Veldhuisen ('19), Emma Fetterly ('20), Piper Boudart ('20), and Emma Stonesmyth ('20). Leah and Emma F. worked on aspects of bromeliad life history evolution, and both helped launch my greenhouse-based research program, helping take extensive data on 300+ bromeliads every month. The first publication from this work has been submitted for peer review. Leah and Emma S. traveled to the high elevation páramo with me and colleagues to study bromeliads in the high Andes, and Leah did further fieldwork solo in Bolivia for her thesis. Leah is now a Ph.D. student in the department of Ecology & Evolutionary Biology at the University of Arizona, and we are working on publishing her thesis. Emma F. and I studied bromeliads in expansive greenhouses of the horticultural trade in Sarasota, Florida and Emma got to pick out her own plants to ship to CC for further study with me and Dr. Shane Heschel. Emma S. spent a lot of time at the bench sequencing new genetic loci and building an enhanced phylogeny of the bromeliad genus *Puya*, offering exciting new insights into the group of plants that I studied for my thesis. Emma helped prepare genomic sampling through a collaboration with a colleague at the National University of Colombia-Bogotá and she got to learn how to assemble whole chloroplast genomes from these data. A first paper exploring these data is forthcoming. Piper worked on a groundbreaking (literally!) project on lichen



Top: Isabel, Leah, Emma F., Prof. Jabaily, Piper, & Emma S. at the Botany 2019 meeting in Tucson AZ – August 2019
Bottom: Leah and Emma S. in Chingaza National Park, Colombia, with Dr. Jabaily and colleagues studying high-elevation Andean bromeliads – October 2018



Top: Emma F. inspecting her thesis bromeliads *Neoregelia tigrina* at *Tropiflora Horticultural Company* in Sarasota, FL – June 2019 **Bottom:** Prof. Jabaily, Emma F., Piper, & Emma S. on a hike after conducting fieldwork in the Flat Tops Wilderness area of Colorado

community phylogenetics. Our lab accompanied her to the Flat Tops Wilderness area of north central Colorado where she continued a sampling of lichens on rocks that have been conducted periodically over several decades. Piper became very adept at lichen identification and took her specimens to the Smithsonian museum in DC (as well as CU-Boulder) where they will contribute to scientific knowledge for generations to come. Piper gave an excellent talk on lichen biology and identification to the Colorado Native Plant Society and is getting involved with the lichen scientific community in her new home of Phoenix.

Luckily, all student research completed as planned before the challenges of Covid arose. We were not able to celebrate the class of 2020's work at in-person OBE day or at graduation, but our group did attend the Botanical Society of America meeting the summer before and most presented there to a wide audience. Emma S. presented at the online Botany conference in 2020. Our lab group stays in touch through periodic Zooms and all of their botanical futures are bright!

Goodeniaceae. Four students (Caroline Brose ('22), Isabel Mansour ('22), Madeleine Tucker ('20), Noah Forman ('20)) worked hard to isolate DNA and sequence loci from many species before the arrival of Dr. Kelly Shepherd, botanist of the Western Australian Herbarium, who was in residence for block 6 (the last pre-Covid times!) The students then worked on building phylogenies of various Goodeniaceae through my Biogeography and Phylogenetics class, delighting Dr. Shepherd with new hypotheses of evolutionary relationships in real time. Their work is ongoing and will expand to include more students in the years ahead!

I'm very excited to return to in-person research mentorship with several new students working on bromeliad greenhouse projects later in spring 2021 (pending continuous school for my young daughter and my own access to a vaccine!). I also dream of taking students to in person conferences again... aiming high for Botany 2022 in Alaska! Many thanks to the funding assistance from OBE donors, as well as the Keller Family Venture Grants.

I have turned to working on phylogenetics of my other plant group, the Australian



Madeleine, Isabel, Caroline, & Noah isolating total DNA from Australian Goodeniaceae samples in Prof. Jabaily's lab – January 2020

Roxaneh Khorsand

Hello to all...we got through 2020 and began a very crazy 2021! What a trip-



*Prof. Khorsand teaching virtual BE105
– Block 3 2020*

Currently in my third year as a visiting professor in OBE, I teach Biology of Plants, Ecology, and Advanced Ecology. Although the block plan initially kicked my butt, I have grown to love it! Until I came to CC, I didn't know how deeply meaningful and effective higher education could be, both for students and faculty. CC students, particularly OBE students, have positively transformed my perspective of undergraduates. What a unique experience: to spend long days in the field and in the lab (pre-covid) with students, delving deep into the material, considering previous studies, and then testing questions for ourselves.

Although the covid pandemic has certainly challenged the way we learn and interact at CC, I know it has made me more receptive, adaptive, and patient. For example, I used a combination of field videos using a GoPro 360 and drone imagery to teach important field concepts in my remote version of BE208. I am very grateful to **Ali Keller** and **Olivia Noonan** for making videos, editing footage, and creating our very own OBE YouTube Channel! Carrying out field courses in the online format would also not be possible without the efforts of **Matt Cooney**, CC's GIS Technical Director, who created novel drone footage of many field sites used by OBE faculty.



BE208 counting species richness on Pikes Peak – 2018



BE308 monitoring phenology at Aiken Canyon – 2019

Another example of adapting OBE courses to online learning is my remote version of BE105, where students use Zoom to view specimens under my microscope and we analyze specimens together in “real time” (you can read more in [this CC news article](#)). While many of us prefer the in-person experience, remote learning reminds us that we can do hard science through the pandemic. These humbling times bring me back to a powerful lesson a very wise, Iñupiat woman told me while I was in the Arctic years ago: “life goes on if you let it.”

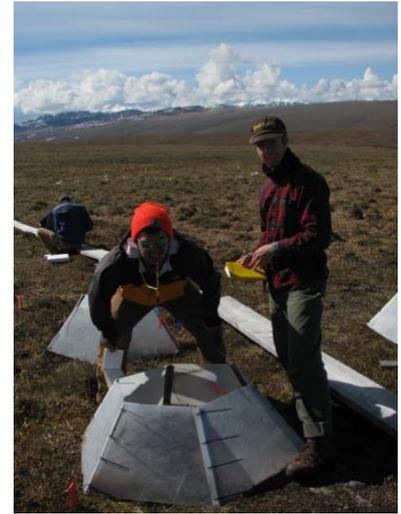
My research investigates the effects of climate warming on plant-pollinator interactions and plant reproductive success in the Alaskan tundra. In 2018, I received a National Science Foundation grant in collaboration with my colleague, Steve Oberbauer at Florida International University, to incorporate pollination into the existing International Tundra Experiment (ITEX). CC students have played a critical role in this ongoing research. Alumni include **John Feigelson** (OBE) and **Hayes Henderson** (EV). John and Hayes spent the 2019 field season collecting data while fighting off clouds of mosquitoes and smoke from the unprecedented forest fires hundreds of miles away! Current CC students

working on the project include **Zach Klingner** (OBE), **Matt Luzincourt** (OBE), **Alex Jennings** (EV), **Lucy Zicarelli** (OBE), and **Thad Allen** (OBE). Although we could not travel to the field in 2020, we collected plant phenological data using time-lapse cameras. Zach and Alex continue to analyze *thousands* of images of our plots, determining the effects of warming on the timing of flowering; they presented their preliminary results at the 2020 Midstates Consortium for Math and Science. Matt and Alex counted *thousands* of pollen grains from insects we collected in 2019 to determine which insects are the most effective pollinators. Lucy and Thad are currently creating SEM images of pollen grains (thankfully not *thousands!*) to fill the knowledge gap of arctic plant reproductive ecology in the face of climate



Time-lapse cameras document phenology and floral visitors in our plots – Summer 2020

disruption. All of this work has been graciously supported by the Hevey Family Fund. I am very grateful to the Hevey Family for supporting my research program.



John and Hayes counting floral density in an open-top chamber in the Arctic – Summer 2019

Here is to high hopes of traveling to the field in summer 2021 and continuing to adapt to change...

Emilie Gray

It's hard to recall how the year began, as it seems so long ago (or maybe it's my aging brain cells!)... 2020 started out really nicely, celebrating the new year with family in upstate New York and getting out for hikes in the winter landscape. One of my biggest highlights through was teaching block 6 Winter Ecology with an awesome group of students: you know who you are! These folks were up for all the adventures Ryan Hammes and I had in store for them. We identified animal tracks and dormant plants and we learned about snow science, avalanche safety, and how to assess snowpack. We met with interesting folks who shared their knowledge and wisdom about wildlife and the winter landscape. Best of all, we went snowshoeing a bunch, including from Crested Butte to Gothic where we stayed in cabins for four nights and explored the beautiful and isolated backcountry surrounding the Rocky Mountain Biological Laboratory. Upon our return to civilization, March 6, was when the matrix of normalcy began to disintegrate. I designed a fully remote Biology of Animals intro class for block 8. I supported my students, India Hilty, Julian Moulton, and Tony Calderon, as they worked incredibly hard through the pandemic chaos to turn in rigorous senior theses and present their research virtually. I helped Pralad Mishra ('23) develop the perfect pandemic summer research project – analysis of NEON mosquito data using R. I grew way too many tomato plants. This fall, I taught a



Snowshoe trip with the Winter Ecology class, block 6 2020

couple really fun upper-level classes and even got to hang out with some of my students in person, masked and socially distanced. Keenan Amer ('19) and I also worked on a manuscript that has now been published in the journal, *Insects*. We're getting it done and



Prof. Emilie Gray relaxing with her dog, Ramsey

students have been super supportive and adaptable. But like so many, I've felt robbed of a fun summer and family holidays this year. I feel so grateful that I haven't lost loved ones so far, and I hurt for those who have. While we did get out for a few hikes and camping trips, nothing has felt the same. It's when you lose something that you realize how valuable it is, so I cannot wait to make the most of my life when we get past this crisis.

And I can't wait for a chance to hug my students again 😊

Brian Linkhart

Greetings, OBE alumni and students, and hope 2021 finds you and your loved ones doing well! The past year of teaching has been one of dramatic contrasts, starting with last January's Patagonia course, where the sky-high anticipation and energy of 14 students, Prof. Marc Snyder, me, and a fleet of outstanding Argentine scientists, were rivaled only by the cruising altitude of Andean Condors gracing the Patagonia skies. Before we returned home in February, our memories were imprinted with images of the Southern Cross by night, and countless adventures in stunning ecosystems by day, and where absorbing discussions of biogeography mixed freely with dialogs about the cool ecology of Southern Beech and Araucaria forests, the Patagonian Steppe, and the Atlantic coastline.



Block 5 2020: Students listening while Dr. Juan Paritsis teaches about fire ecology in the Chalhucaco Valley outside Bariloche, Argentina

As a field biologist, I don't think I ever foresaw the day I would teach an online course, but after Patagonia, that's all I (and most everyone else) have known in the past year! My first experience with Zoom (ever) was in Block 8 Ornithology last Spring, and birding modules produced by the renowned Cornell Lab of Ornithology helped tackle roles usually filled by trips to the Chiricahua Mountains in southeast Arizona. While Zoom also was a major player



Flam Crew 2020: COVID-19 special edition

in my Biology of Animals and Ecology courses this past fall for lectures and discussions, I received major tech support from our OBE staff, Ali Keller and Olivia Noonan, and GIS guru, Matt Cooney, who used drones, GoPro 360, and other cameras to make video demos of everything from ponderosa pine forests and the Hayman Burn scar, to dissections of sheep brains and fresh beef hearts! Look out, Nat Geo!

The summer of 2020 marked the 40th consecutive year of the Flammulated Owl Research Project, and the pandemic came close to breaking the string of continuity. COVID-19 precautions presented a

plethora of barriers, including the indefinite closure of the Manitou Experimental Forest, home of two study sites that have served as foundations of the project—owls were free to come and go, but not their researchers. I had filed for an exemption with the USFS leadership, and at the 11th hour it was granted—but with just 3 weeks left before owlets started fledging, students and I had to go into overdrive to salvage what we could. Despite many challenges to our routine—living out of tents and cooking over backpacking stoves while dodging young bull moose in Hotel Gulch, among other things, the Flam Crew (Eliza Stein, Olivia Noonan, Adam Mahler, Sarah Lloyd, and Kyle Cadwallader) and I marked several accomplishments. To wit: we located, captured, and banded owls at 16 nests; attached migration-tracking bling to the backs of three males and recovered the 2019 migration data from another male (apparently he's fond of the night scene around Acapulco in January); and Eliza and Sarah survived a Black Bear's epic climb of a nest tree they had just hiked in to observe (owlets survived, tree didn't, bear and researchers no worse for the wear). On top of this, Olivia and Sarah documented the first known instance of helping behavior in Flammulated Owls—in addition to the standard nest care provided by the parents, a previously unbanded UFO (unidentified Flammulated Owl) was caught red-handed (-footed?) delivering groceries to young owlets. Flam Crews in past years had been on guard to try and document this unusual behavior, which we had suspected on several occasions, but we had never previously been able to capture and confirm the identities of all adults feeding the young. Next step is to determine if the helper male is genetically related to the owl family, based on blood DNA analyses, before these Flam Crew members achieve author status in the scientific literature (along with immortality in Flam Crew lore). Bring on the fifth decade!



A male Flammulated Owl wearing a PinPoint GPS unit on his back to track his migratory path. Photo by Eliza Stein '18

Shane Heschel

The Heschel Lab - We have been busy with stress physiology research the last couple of years. We published the following two papers and a poster in 2020: "Early snowmelt reduces aphid abundance (*Aphis asclepiadis*) by creating water stressed host plants (*Ligusticum porteri*) and altering interactions with ants" - Arthropod-Plant Interactions & "Snowmelt timing determines aphid abundance through multitrophic interactions" - Acta Oecologica. These papers were the result of a collaboration that began in 2018 with Dr. Emily Mooney at UCCS. Along with both CC and UCCS students, we investigated how plant drought status might influence the ability of *Ligusticum porteri* plants to defend themselves from aphids. As part of her work to assess the impact of warming and snow-melt timing on plant fitness, Elsa Godfredsen '19 and I assessed the drought status of this species in experimental snow-melt plots in 2018-2019. We also collected data on the abscisic acid (ABA) hormone composition of the field plants in my lab at CC in 2019. In addition, three years of CC student projects on



Natalie Colao '21 measuring transpiration on *Impatiens* to investigate how seedling performance differs geographically – Summer 2020

the impact of shade on tamarisk water relations, photosynthesis, and fitness resulted in a published poster from the 2020 ESA meeting (F1000). This poster will contribute to the literature on tamarisk control (an invasive plant species in the Southwest US); the data demonstrate that shade from canopy trees like cottonwood may be sufficient to control the spread of tamarisk. Currently, Charlotte DiBiase '20, Alex Shapiro '20, Elsa, and I are working on a data set from thesis work in my lab (2016-2020) with the ecological model, *Ipomopsis aggregata* (scarlet gilia). These data examine how this flowering plant species



Pink vs. red Ipomopsis – UV tolerance differences?

tolerates UV stress at high elevation with the pigment anthocyanin; anthocyanin is a red pigment that colors flowers and leaves, attracting pollinators and protecting plants from UV stress. We have found evidence that plants at high elevation benefit from less anthocyanin in their flowers to attract a greater diversity of pollinators; however, in decreasing the amount of anthocyanin in their flowers, these plants become less tolerant of UV stress – a tradeoff! I continue to give students a first-hand dose of plant stress in the Sonoran desert with my plant eco-physiology class. Of course, with the pandemic this class was remote last spring - nonetheless, students still learned about stress physiology in plants and analyzed real data from past field trips on how saguaro cacti tolerate thermal stress. Finally, Charlotte, Elsa, and I digitized most of the Carter/Kelso herbarium at CC - you can find this amazing digital resource on our [department website](#).

Mark Wilson

I have for several years now been studying the phylogenetics in the orchid genus *Pleurothallis* using nuclear and chloroplast DNA sequences and studying floral micromorphology using scanning electron microscopy (SEM). Recently I have become interested in pollination mechanisms among the



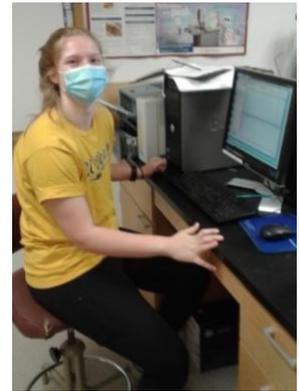
Raven Ward '21 working in the lab – Summer 2020

species of *Pleurothallis* since some exhibit morphology suggestive of a reward pollination syndrome (where the flower provides nectar to the pollinator) whereas a few exhibit very different floral morphologies suggestive of deceit pollination (where no reward is provided). While some flowers exhibiting deceit pollination mimic other rewarding species, some have evolved to mimic a female insect, thereby attracting the male of the pollinator species and through olfactory, visual and tactile signals deceiving it into attempting to mate with the flower. This latter pollination syndrome is termed sexual deceit and may even result in what is called pseudocopulation, the consequence of which



Profs. Mark Wilson and Murphy Brasuel using GS-MS (pre-pandemic)

being that the male insect acquires the pollen from the flower. The floral morphology of some *Pleurothallis* species, in particular those in the *Pleurothallis crocodiliceps* species complex, suggests that they may be pollinated by sexual deceit. We are testing the hypothesis that some species of *Pleurothallis* are pollinated by sexual deceit through examination of the olfactory signals produced by the flowers and determining whether the flowers produce a reward of sugar-containing nectar, oils or other chemicals. In collaboration with Murphy Brasuel and Nate Bower in Chemistry, analyses of floral scents that may act as allomones (pheromone-like chemicals) are being done using gas chromatography-mass spectrometry (GC-MS), while analyses of the different sugars in nectar are being done with liquid chromatography-mass spectrometry (LC-MS).



Izzy Hensley '22 using GC-MS – Summer 2020

Boyce Drummond

I have spent this lock-down pandemic year at home in Fort Collins. My classes this year were either cancelled (Aspen Center for Environmental Studies, Forest Conservancy), or taught online (Entomology for CC and Natural History workshops for Fort Collins Natural Areas). I continue to spend one day a week working at the Gillette Museum of Arthropod Diversity at CSU, volunteer work which was interrupted this year by a five-month closure that ended in August. To maintain my entomological chops during that fallow period, I identified voucher specimens for Roxaneh Khorsand from her tundra pollination studies in Alaska. Entomology (BE412) this year has been shifted from Block 7 to Summer Block A, in anticipation that by then the class can be in person and involve field trips. Shane Heschel and I are hoping we can substitute a June trip to John Martin Reservoir in SE Colorado for our usual Block 7 combined-class camping trip to the Arizona desert (cancelled now for the second year). Meanwhile in northern Colorado, I have enjoyed learning to play mandolin, taking daily natural history hikes (with Baxter, my faithful tree-climbing Cavalier King Charles Spaniel), and expanding my online bookselling business (Paradox Books USA). I'm still mourning the loss of John Prine to COVID on April 7, hoping for the reappearance of the RockyGrass Bluegrass Festival in Lyons this July, and thankful for my continued good health. I am eager to end my Fort Collins exile by returning to Colorado Springs this summer to teach Entomology and see my CC friends and colleagues again. Be well, do good work, and keep in touch. Boyce

Ali Keller, Lab and Greenhouse Coordinator

Hi all! I joined the OBE Department in the fall of 2017 after getting my Master's degree in Forest Ecology/Tree Physiology at the University of New Mexico. My husband and I are both from Colorado, so it felt nice to finally be coming back to our home state after 8+ years away! I love working with students in a variety of our classes, but work most closely with our plant-oriented classes. I often accompany classes on field trips (in normal years!) and help students with research projects and data analyses. I also take care of our greenhouses and maintain the plants that are used for research and in classes. In the past few years, I've helped students to study impatiens with Shane Heschel and various bromeliads with Rachel Jabaily. More recently, I've helped created laboratory videos and online curriculum for all of our virtual classes. I am hoping that campus will get back to some sense of normalcy here soon, but until then, I'm available virtually if you have any plant care related questions!

Olivia Noonan, Paraprofessional

Hello! I graduated CC last spring, and although my senior year was cut short, I'm incredibly thankful for the opportunities and experiences I had within the OBE department. Throughout my (pre-pandemic) time at CC, I was fortunate to explore the cool life zones of Colorado and even study in South America for a semester in Ecuador & the Galápagos as well as a block in Patagonia with Marc Snyder and Brian Linkhart — all while growing my passion for ecology along the way. I also spent three summers doing research on Brian's "Flam Crew" that culminated in my senior thesis study on primary feather molt and development patterns of Flammulated Owls. Although the traditional OBE Day was cancelled last spring, the other thesis/research students and I each created a virtual presentation (perhaps the first of many) and shared our work on the OBE webpage.



Holding a Flammulated Owl nestling after banding it and taking measurements



Chuck says hello and looks forward to having student visitors again!

This year as paraprof has certainly not been what I expected it to be, but I've really enjoyed it regardless (plus, I have a pretty cool officemate, Chuck the Ball Python). Instead of taking students on field trips and assisting with labs, I've had to devise creative ways to help teach material in classes where field and lab components are so crucial — one way we've done this was by creating our new OBE YouTube channel (who knew creating silly videos in middle school would actually come in handy one day...). Ali and I have had fun inflating cow lungs, dissecting shark brains, and going into the field to make countless videos with faculty to show the different life zones of Colorado, demonstrate field research techniques, and even use drone imagery to show the neat ecosystems found around the Manitou Experimental Forest. While I'm sure these videos will continue to serve as helpful resources in the future, I know they still can't replace in-person learning. I can only hope that one day soon students will be able to have the full "OBE experience" again!

Steve Langlois, Animal & Laboratory Assistant

Hello from the basement of Barnes Science Center! The animal suite houses frogs, doves, a turtle, fish, and various insects and other invertebrates. Chuck the Ball Python still holds a place of honor with his enclosure housed in the paraprof's office. We work closely with the Institutional Animal Care and Use Committee to take good care of all the critters. The fourth floor OBE aquarium underwent some major changes last year through the hard work of three senior students. Adrian Ward, Xavi Dominguez, and Joe Gustadt undertook the task of establishing an aquaponics display but their ability to see it to completion was cut short by pandemic restrictions and the closure of campus (see below). With some changes to the original plan, we did get an aquarium up and running with a modified watering system. Additionally, we recently added plants to the setup. Many thanks to Adrian, Xavi, and Joe as well as Dan Crossey from the carpenter shop and Steve Burt from the Olin Engineering shop.



I had the opportunity to travel to Alaska for the first time this past summer and enjoyed the amazing scenery and wildlife. The first morning there, I woke up to a moose and two calves walking by the bedroom window. It never slowed down from there. My days at home are filled with house projects and keeping my old motorcycle running.

I miss seeing students walking the halls and filling the classrooms. I hope the time is not far off when that will once again be a reality for all the departments. I send out a thank you to all the kind students past and present that have so graciously stayed in touch. It is nice to hear what is happening in your lives. Stop by and say hello if you are on campus!



Student Aquaponics Project *Adrian Ward '20 & Xavi Dominguez '20*

We are both recent graduates of CC and began this project after just watching some YouTube videos on hydroponics (growing plants in water with soluble nutrients) that we found really interesting. After going down a long rabbit hole of videos, we eventually learned about aquaponics (a cycle of growing plants which filter the water for fish who provide the nutrients), which we thought was even cooler. We really wanted to build our own aquaponics system, but we reached an impasse because we did not have the money or the stability due to how often students at CC have to move. Eventually we realized that we would be able to take advantage of the school's resources in order to build a tank that could have a permanent home somewhere at the school. We enlisted our friend Joe Gutstadt who was knowledgeable about fish for help, and applied for the Life of the Mind Grant.

When we were awarded the grant, we got to working on building and designing the tank. Unfortunately, due to a lack of time, Xavi and I had to work on the rest of the tank without Joe's help. We had a lot of fun working on the details with Dan Crossey from the Carpentry Shop at CC. We had to design the stand to hold a lot of weight because water is so heavy, and we wanted to make the stand durable and stylish. Aside from the Carpentry Shop we also spent a lot of time working with Steve Burt from the Fabrication and Machining Lab at CC. The green aluminum pieces that hold the light were designed, cut, refined, and anodized by us! We also made the three translucent polycarbonate covers for the fish tank.

All of these detail-oriented and time-consuming custom creations for the tank lead to us not following our timeline that we set out for the project. We thought that we would be able to finish it towards the end of our senior year or even during the summer, but then the pandemic hit. We were lucky enough that our project mentors, Shane Heschel and Steve Langlois, who gave us invaluable advice and support, finished the project without us. They added a lot of their own vision in the aquascaping and completed the plumbing and filling of the fish tank.



The fish tank in the OBE department is up and running again – this time with an aquaponics system in place! Many thanks to Steve, Adrian, and Xavi whose efforts helped get this started.

Student Research Spotlight

Courtney Knerr '21

After spending a semester in Sydney, Australia working in an Evolutionary Ecology lab and recording the song of two subspecies of Long-tailed Finches, I am now analyzing the recordings as my senior thesis. Using R and two programs developed at the Cornell Lab of Ornithology, warbleR and Raven, I am looking to see what differences exist between the song of the two subspecies as well as how the song of their F1 hybrid offspring compares in terms of complexity and performance ability. This is part of a larger project being done at Macquarie University to study reproductive barriers that might exist between the two subspecies where their ranges overlap in the wild in Northern Australia.



Left: Courtney holding a Red-tailed Hawk at the Ark Wildlife Education and Rehabilitation Center where she volunteers **Right:** A subspecies of Long-tailed Finch (*Poephila acuticauda hecki*) that Courtney used in her research

This project has certainly been challenging with the large amount of coding involved, but I have learned a lot about bioacoustics analysis, which is a fascinating field. After graduation, I am currently hoping to go into environmental nonprofit work, but I am definitely considering grad school for ecology down the road, and this is a topic that I would love to continue studying!

Matt Luzincourt '21



Left: Matt collecting data for his independent study research **Right:** A Coleoptera (beetle) species on a Rubber Rabbitbrush flower

I spent Block 1 collecting data for my independent study with Professor Brian Linkhart. I went to different parks in Colorado Springs to do visitor watches at various flowers. It was definitely a big challenge to ID all the different insects that were spotted, which ranged from velvet ants to hover flies.

The visitor watch data was used to compare the differences in pollinators between parks with high human traffic and parks with low human traffic. For the most part, there was no significant differences in floral visitors found between the two groups. But more data is definitely needed to improve confidence in the statistical tests!

Ana Kilgore '21

My thesis looks into landslide occurrence in the Sierras de las Minas mountains of Guatemala and is focused on determining the importance of bioclimatic and topographic factors on the spatial distribution of landslides. Additionally, we are examining the role of landscape memory in landslide occurrence. Landscape memory is the idea that prior disturbance events play a role in determining the distribution of future disturbance events. To do this, we are using remote sensing technology to find the locations of landslide scars from several different time periods and examining the relationship of biotic and abiotic factors with the spatial distribution of landslides for individual years, and investigating the significance of landslide overlap/reoccurrence over multiple time periods. Understanding the causality and impact of these disturbance events is important for both the conservation and management of the diverse and important ecosystems in which they occur, especially in the face of global changes and increasing infringement of human infrastructure on historically natural spaces.

Sarah Lloyd '21



Sarah holding a breeding female Flammulated Owl in the Manitou Experimental Forest – July 2020

After working on Dr. Linkhart's Flammulated Owl research crew for the past two summers, I spent this past semester analyzing the role of peak food abundance and climate on Flammulated Owl reproduction. I utilized 40 years of Flammulated Owl reproductive phenology and success data along with ambient temperature data from the reproductive season and the timing of abundance of the Flammulated Owl's primary food source, noctuid and geometrid moths, from the past 12 years. I found that Flammulated Owl reproductive success is highly correlated to the timing of reproduction – the earlier in the season the owl initiates incubation the greater the likelihood

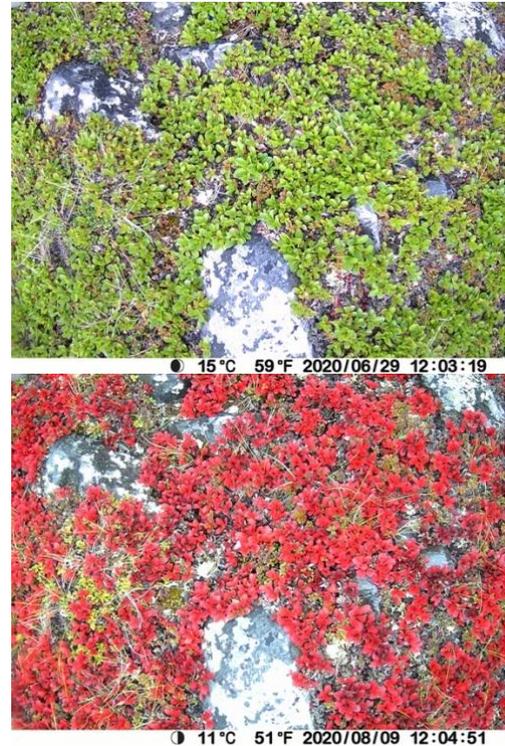
is of a successful nest. I also found that maximum May temperatures at the beginning of the reproductive season strongly influence the timing of reproduction, with higher temperatures causing the initiation of incubation to occur earlier. This will likely be very important as climate change effects continue to intensify. I also found that the timing of hatching in the Flammulated Owl is highly synchronous with peak food abundance and that no phenological mismatch is currently occurring.

Working with Dr. Linkhart's data, two years of which I was lucky enough to help collect, has been a challenging and extremely rewarding experience. I am excited to do more ecological fieldwork in the future.

Zach Klingner '22 & Alex Jennings '22

We were originally planning on traveling to the Toolik Field Station in Alaska to work with Dr. Khorsand this past summer. The objective of our continued research is to establish a pollination network and determine how warming impacts the historically synchronous relationship between plants and their pollinators. Due to the COVID-19 lockdowns, we were unable to travel to our field sites, prompting us to use time-lapse cameras on 24 plots to determine the timing of flowering (an important component of the larger project). The cameras started running in June and went to September. To document which insects visit which plants, staff of the Environmental Data Center at Toolik Field Station performed visitor observations. Each visitor observation consisted of a five-minute period in which insect order, plant species visited, and number of floral landings were recorded. With over 160,000 images, we are still processing plant phenology data. We do however expect to see earlier anthesis in the warmed plots compared to the controls, although this response may be species-specific.

The use of still cameras meant we were limited to a single perspective on our plots and thus may have missed elements that would have been visible in-person. We were, however, able to capture phenological changes for the entire season, allowing us to accurately estimate the period of anthesis, a form of data collection we will continue in the future. Assuming travel is possible for the 2021 season, we intend to carry out visitor observations paired with lab work, exclusion experiments and phenology data to examine the potential risk for species-specific phenological mismatch. We thus hope to investigate whether pollinators' life cycles are adjusting synchronously with plant communities under a warming scenario or whether the shift in climate will lead to a phenological mismatch.



Time-lapse images from one of the plots used in Zach and Alex's remote research with Dr. Khorsand

Club Feature: CC Tiger Audubon Society *Mary Rudolph '22*

I first formed Tiger Audubon, CC's birding and conservation club, after attending the National Audubon Society Convention in Wisconsin in 2019. The overall atmosphere of environmental hope and ornithological friendship inspired me to bring Audubon's message back to Colorado College. I was also entering Colorado College as a sophomore-year transfer student and wanted to find a group of friends with a common interest. I have since then become a chair on the Audubon Rockies Board and harbor a strong passion for protecting birds and their habitat, especially in Colorado. Since its 2019 inception, Tiger Audubon has accomplished many goals and undergone numerous activities. In 2019, when events could be held in person, Tiger Audubon visited Fountain Creek, Bear Creek Park, and Stratton Open Space to count birds. The group also contributed community science data to the 2019 Christmas Bird Count in Monument Valley Park and attended bird-themed presentations with the local Aiken Audubon chapter at the Bear Creek Nature Center. 2020, of course, looked a little bit different. Tiger Audubon started social media pages on Instagram and Facebook, where we hosted virtual birding counts, ID contests, and photography sharing. Our hopes for the future include initiating a native plant garden on campus, more birding outings, Aiken Audubon collaborations, bird window collision data collection on campus, and teaching about the joys of birds and the world in which they live!



Students birding at Fountain Creek Nature Center on a day trip during Fall 2019. Photos by Heather Rolph '21



A Great-horned Owl spotted on one of our birding outings in Colorado Springs. Photo by Olivia Noonan

Interested in participating in our club activities? Email tigerauduboncc@gmail.com if you would like to be added to our email listserv. Be sure to follow us on Instagram **@tigerauduboncc** and join our Facebook group "**Tiger Audubon CC**" to hear about upcoming virtual birding events! All levels of birders are welcome to participate and no prior birding experience is necessary!

2020 Achievements

OBE Graduates

Congratulations to the class of 2020!

Madeline Bodell
Piper Boudart*
Alicia Bourelly
Antonio Calderon*
Charlotte DiBiase*

Nabeel Elabdeia
Emma Fetterly*
Noah Forman
Emerald Green
India Hilty*

Mia Hsu
Wilson Kaplan
Kristen Kinchla
Harper Kral
Alden Landry

Jeremy LeMenager
Thomas Lutz
Adam Mahler
Jenna McDonald
Cian McGillicuddy
Lucy McMath
Julian Moulton*

Olivia Noonan*
Marisa Peña-Alfaro
Sarah Pokelwaldt
Charles Schneider
Alexandra Shapiro
Madison Sternitzky
Garrett Stokes

Hannah Stoll
Emma Stonesmyth*
Madeleine Tucker
Evan Underbrink
Maximiliano Vasquez

* indicates Distinction in Organismal Biology & Ecology

Honors Convocation OBE Award Recipients

Richard and Reba Beidleman Award – *Piper J. Boudart & Charlotte N. DiBiase*
Jason Wilkes Memorial Biology Award – *Ana C. Kilgore & Matthew Luzincourt*
James H. Enderson Research Award in Biology – *Olivia S. Noonan & Adam T. Mahler*
Mary Alice Hamilton Award in Organismal Biology & Ecology – *Emma W. Fetterly*
Laboratory Award in Organismal Biology & Ecology – *Emma C. Stonesmyth & India E. Hilty*

OBE Day Presentations

Although last year's OBE Day was entirely virtual, the student thesis presentations and research posters are available on our website! Click the links below to view each project.

Thesis Presentations

Community Phylogenetics of Lichens in the Flat Tops Wilderness Area of Colorado – *Piper Boudart '20*

Finding the Best Injury Risk Assessment for the Lower Extremities – *Tony Calderon '20*

Maternal Floral Color, UV Protection, and Germination in *Ipomopsis aggregata* (Polemoniaceae) – *Charlotte DiBiase '20*

Life history and physiology of iteroparous reproduction in *Neoregelia tigrina* (Bromeliaceae) – *Emma Fetterly '20*

Are Detoxification Gene Mutations Associated With Insecticide Resistance in *Aedes aegypti* Mosquitoes? – *India Hilty '20*

Metabolism of the Spring Field Cricket *Gryllus veletis* During Freezing, Thawing and Recovery – *Julian Moulton '20*

Primary Feather Molt Patterns in Flammulated Owls (*Psilosops flammeolus*) of the Pikes Peak Region – *Olivia Noonan '20*

Molecular phylogenetics and molecular dating of Chilean *Puya* (Bromeliaceae) – *Emma Stonesmyth '20*

Poster Presentations

The Effect of Experimental Warming on Plant-Pollinator Relationships in the Low Arctic – *John Feigelson '19, Prof. Roxaneh Khorsand*

Disease-driven dynamics of evolutionary rescue from a game theoretic perspective – *Ana Kilgore '21*

Characteristics of Stopover Sites in the Neotropical Migrant, the Flammulated Owl (*Psiloscops flammeolus*) – Sarah Lloyd '21, Matthew Luzincourt '21, Kyle Cadwallader '21, Prof. Brian Linkhart

Impacts of Nest Habitat Quality on Flammulated Owl (*Psiloscops flammeolus*) Reproductive Success in the Pikes Peak Region – Adam Mahler '20, Prof. Brian Linkhart

Diel Variation in Coral and Algal Respiration and Photosynthesis – Charlie Schneider '20

Cotyledon stomatal density differentiation and quantitative genetic analysis of seedling traits in *Impatiens capensis* ecotypes – Alex Shapiro '20, Lina Farias '22, Prof. Shane Heschel, Prof. Ron Hathaway

Recent Faculty Publications

Emilie Gray

Amer, K., K. Saavedra-Rodriguez, W.C. Black IV, and E.M. Gray. 2021. Effect of Selection for Pyrethroid Resistance on Abiotic Stress Tolerance in *Aedes aegypti* from Merida, Yucatan, Mexico. *Insects*: 12:124.

Heinrich, E.C., E.M. Gray, A. Ossher, S. Meigher, F. Grun, and T. J. Bradley. 2017. Aerobic function in mitochondria persists beyond death by heat stress in insects. *Journal of Thermal Biology* 69:267-274.

Shane Heschel

Mooney, E., M. Mullins, J. Den Uyl, S. Trail, P. Nguyen, J. Owens, E. Godtfredsen, and M.S. Heschel. 2020. Early snowmelt reduces aphid abundance (*Aphis asclepiadis*) by creating water-stressed host plants (*Ligusticum porteri*) and altering interactions with ants. *Arthropod-Plant Interactions* <https://doi.org/10.1007/s11829-020-09793-2>.

Den Uyl, J., M. Mullins, M.S. Heschel, and E. Mooney. 2020. Snowmelt timing determines aphid abundance through multitrophic interactions. *Acta Oecologica* 108:103606.

Heschel, M.S., K. Dalton, M. Jamason, A. D'Agnese, and L.G. Ruane. 2017. Drought Response Strategies of *Clarika gracilis* (Onagraceae) Populations from Serpentine and Nonserpentine Soils. *International Journal of Plant Sciences* 178.313-319.

Rachel Jabaily

Jabaily, R.S., K.A. Shepherd, P.S. Michener, C.J. Bush, R. Rivero, A.G. Gardner, and E.B. Sessa. 2018. Employing hypothesis testing and data from multiple genomic compartments to resolve recalcitrant backbone nodes in *Goodenia* s.l. (Goodeniaceae). *Molecular Phylogenetics & Evolution* 127: 502-512.

Shepherd, K.A., Wege, J.A., and R.S. Jabaily. 2017. Proposal to conserve the name *Goodenia* (Goodeniaceae) with a conserved type. *Taxon* 66 (3): 757-758.

Roxaneh Khorsand

Khorsand, R. and O. Awolaja. 2020. Breeding system and pollination of *Thermopsis divaricarpa* (Fabaceae: Papilionoideae) in the southern Rocky Mountains. *Western North American Naturalist* 80(4): 509–520.

Koptur, S. and Khorsand, R. 2018. Pollination ecology of three sympatric palms of southern Florida pine rocklands. *Natural Areas Journal* 38: 15-25.

Brian Linkhart

Ciaglo, M., R. Calhoun, S.W. Yanco, M.B. Wunder, C.A. Stricker, and B.D. Linkhart. 2020. Evidence of post-breeding prospecting in a long-distance migrant. *Ecology and Evolution* XX:1-13.

Herzog, J.L., J.M. Eisaguirre, B.D. Linkhart, and T. L. Booms. 2019. Golden Eagle diet in western Alaska. *Journal of Raptor Research* 53:393-401.

Yanco, S.W., and B.D. Linkhart. 2018. Changing fire regimes and faunal responses: Habitat use by Flammulated Owls after fire in Colorado, *in* Trends and traditions: Avifaunal change in western North America (W.D. Shuford, R.E. Gill Jr., and C.M. Handel, eds.), pp. 419-431. *Studies of Western Birds* 3. Western Field Ornithologists, Camarillo, CA; doi 10.21199/SWB3.22.

Mark Wilson

Wilson, M., Larsen, B.T., Zhao, K., Posada, J.F., Aguirre, G., and Uribe Vélez, C. 2019. A beautiful new species of *Pleurothallis* (Orchidaceae, Pleurothallidinae) in the *P. crocodiliceps* complex from Colombia. *Orquideología* 36(2): 111-126.

Wilson, M., Zhao, K., Hampson, H., Chang, M., Reina-Rodríguez, G.A., and Niessen, A. 2019. Hidden in plain sight: A new species of *Pleurothallis* (Orchidaceae: Pleurothallidinae) from Colombia previously misidentified as *P. luctuosa*. *Lankesteriana* 19(2): 771-91.

Wilson, M., Zhao, K., Hampson, H., Frank, G., Romoleroux, K., Jiménez, M., Tobar, F., Larsen, B. & Pérez, A.J. 2018. A new species of *Pleurothallis* (Orchidaceae: Pleurothallidinae) in subsection *Macrophyllae-Fasciculatae* with a unique, highly reduced, morphologically distinct labellum. *Lankesteriana* 18(3): 217-230.

Diaz Hernández, A.G., Ocupa Horna, L.A., Yupanqui Godo, L.E. and Wilson, M. 2018. A new species of *Andinia* (Orchidaceae, Pleurothallidinae) from Huánuco, Peru, and the first Peruvian locality for *Andinia schizopogon*. *Phytotaxa* 361(2): 222-232.

Wilson, M. 2018. *Pleurothallis gracilicolumna* (Orchidaceae, Pleurothallidinae), a new species from Colombia related to *P. talpinaria*, *P. trimeroglossa* and *P. jostii*. *Orquideología* 35(1): 31-51.

Wilson, M., Jimenez, M.M., Jost, L., Kay, A., Frank, G., and Baquero R., L.E. 2018. A new species of *Pleurothallis* (Pleurothallidinae, Orchidaceae) from northwestern Ecuador with affinities to both subgenus *Ancipitia* and *Scopula*. *Phytotaxa* 343(3): 249-258.

Wilson, M., Vieira-Uribe, S., Aguirre, G., Posada, J.F., and Dupree, K. 2017. Two new species of *Pleurothallis* (Pleurothallidinae; Orchidaceae) in subgenus *Ancipitia* from Colombia. *Orquideología* 34: 34-51.

Wilson, M., Baquero R., L., Driessen, W., Dupree, K., Gil, K., Portilla, J. and Salas Guerrero, M. 2017. A clarification of the distinction between *Pleurothallis talpinaria* and *Pleurothallis trimeroglossa* (Orchidaceae: Pleurothallidinae) and an allied new species from Ecuador. *Lankesteriana* 17(2): 133-151.

Wilson, M., Dupree, K., Driessen, W., Larsen, B.T., Löckher, A., Niessen, A., Portilla, J., Salas Guerrero, M., Suarez, M.A., and Tobar Suárez, F. 2017. A clarification of the taxonomy

of *Pleurothallis crocodiliceps* (Pleurothallidinae; Orchidaceae) and four new species of *Pleurothallis* in subgenus *Ancipitia*. *Lankesteriana* 17(2): 165-191.

Wilson, M., Dupree, K., Garcia Lopera, D., Haelterman, D., Kay, A., Mesa Londoño, C., Niessen, A., Pinnix, W., Portilla, J. and Werner, J. 2017. A new species of *Pleurothallis* (Orchidaceae: Pleurothallidinae) from Valle del Cauca, Colombia and a note on the relationship between subsections Macrophyllae-Racemosae and Antenniferae. *Lankesteriana* 17(2): 119-131.

Wilson, M., Frank, G.S., Jost, L., Pridgeon, A., Vieira-Urbe, S., and Karremans, A. 2017. Phylogenetic analysis of *Andinia* (Orchidaceae: Pleurothallidinae) and a systematic recircumscription of the genus. *Phytotaxa* 295(2): 101-131.

Jim Ebersole

Webster, L. and J.J. Ebersole. 2020. Understanding the human-animal interface: Maasai perceptions of dogs in northern Tanzania. *Society and Animals* 28:357-376.

Hägerling, H.G. and J.J. Ebersole. 2017. Roads as travel corridors for mammals and ground birds in Tarangire National Park, Tanzania. *African Journal of Ecology* 55:701–704.

Johnson, J.E. and J.J. Ebersole. 2017. Response of *Acacia tortilis* to elephant browsing in Tarangire National Park, Tanzania: possible above-ground compensation? *Journal of Young Investigators* 32:1-6.

Marc Snyder

Hammer, A., N. Bower, A. Snyder, Z. Snyder, F. Archila, and M. Snyder. 2020. Longitudinal study of Caribbean pine elucidates the role of 4-allylanisole in patterns of chemical resistance to bark beetle attack. *Journal of Tropical Ecology* 36:43-46.

Alumni Spotlight

Current students & other alumni – below are features from some young OBE alumni who have started careers and graduate education in various subsets of Biology. If you are interested in or have questions about any of their fields, we encourage you to reach out! Email noonan@ColoradoCollege.edu for individual contact information.

Grete Wilt '14

After graduating from CC with a biology degree in 2014, I completed my MPH degree in Environmental Health from Emory University in 2016. While attending Emory, I worked for EcoHealth Alliance, a non-profit research organization in New York City, detecting emerging infectious diseases. I have spent the last 5 years at the CDC working as a spatial epidemiologist and statistician in the Geospatial Research Analysis and Services branch investigating how place-based factors influence and drive health outcomes. I am currently in the second year of my PhD in Environmental Epidemiology at Harvard University further researching how we can improve the measurement of place-based exposures using human



In 2016 with CDC Director, Tom Frieden

movement data. Despite leaving the mountains and block breaks behind, I have still found ample time for adventures. My two rescue dogs Sasha and Ranger are always excited to get outdoors! As we begin 2021, I want to take the time to remind everyone this pandemic is not over. I implore everyone to stay physically distant, wear a mask and encourage friends and family to receive the vaccine as soon as it is available for them. As biology students with your knowledge, you can actively combat the misinformation that spreads about COVID-19. Having these conversations will (hopefully) lead to herd immunity and the chance to gather in person again!



On a road trip in 2019 with our dogs Sasha (left) and Ranger (right)

Nathan Hahn '14



Nathan with Hugo the elephant a couple days after he was treated for an arrow wound from conflict

When I graduated from CC in 2014 with a biology degree, I was unsure of which path I wanted to take. I had dabbled in some research experience with Marc Snyder on his squirrel crew and conducted an independent study on human-wildlife conflict in India, but I thought working in the NGO sector might have more opportunities to be a part of direct conservation action. I spent my final months at CC sending out many emails to scientists at different NGOs around the country to talk with them about their experience and do my best networking impression. From one of these calls, I learned about a startup conservation program, Biodiversity and Wildlife Solutions at RESOLVE, with a

focus on testing and developing conservation technologies. This opportunity turned into a full-time position as a Research Associate, where I gained a lot of experience with (at the time) new technologies including drones, real-time cameras, and remote sensing, in addition to international work and academic research. After 4 years at RESOLVE, it became clear that I needed a higher education degree to continue advancement in my career, and I started to reach out to professors with similar research interests. I was fortunate to receive a Graduate Research Fellowship from NSF, and I am now in the fourth year of my PhD in Ecology at Colorado State University, researching how we can reduce human-elephant conflict and inform landscape planning using elephant movement data in Kenya. I had a winding route after graduating from CC, and I value all of these experiences. While it was difficult returning to school after almost 5 years off, that time helped me explore different interests and passions beyond work. Things are very different now than when I left CC, but research and field work have not stopped, and in many cases the pandemic has opened up new research and conservation activities (e.g. human-wildlife disease transmission, autonomous data collection, and analysis of existing datasets). My advice to anyone looking for their next step is to reach out and talk to professionals in your field to get advice and learn about what opportunities are out there.

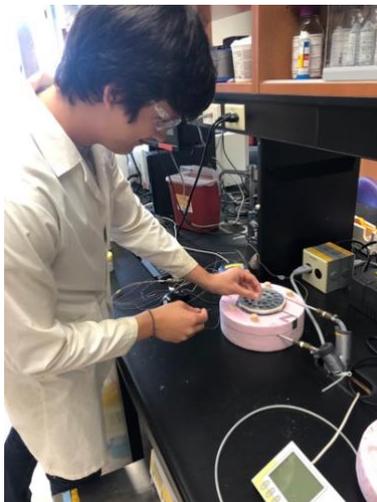
Anita Wray '19

During my time at CC, I knew I wanted to pursue marine ecology as a career. I was able to supplement my academics with marine-based internships in Massachusetts and Maine. I first found out about my second internship, which provided the backbone for my thesis, by emailing over 15 professors to ask if they had room for a summer intern. After one year as a marine teaching fellow at The Island School in The Bahamas, I was accepted into graduate school at the University of Washington. Additionally, I am a student assistant for the Washington Sea Grant education team. For my thesis, I will be studying the population genetics of rockfish to better inform their management in Puget Sound. Although I didn't hope for my first year of graduate school to be online, it has given me the opportunity to learn non-laboratory skills that have proven to be incredibly important for my career. Skills such as coding, modeling, and statistics can be a huge stepping stone for future careers, and are easily learned in quarantine!



One of the best pieces of advice I received from my CC professors about graduate school was about persistence. Cold emailing professors can be largely unsuccessful and quite disappointing for many, especially if you are not coming in with funding. Try not to focus on one or two professors that you like, aim for at least eight. If you are interested in a marine-focused career or graduate school, please email me with any questions!

Julian Moulton '20



Julian attaching thermocouples to crickets before placing them in a cooling bath to determine the temperature at which they freeze

The opportunities I had at CC helped me get started in biological research. In the class Comparative Animal Physiology taught by Professor Emilie Gray, I learned how to use a respirometer to measure metabolic rates of organisms. The following summer, Emilie connected me with a professor at Western University in Canada, and I worked there using respirometry to study the metabolic effects of freezing on certain freeze-tolerant insects. I wrote my thesis on this project, and our paper, titled "Metabolic cost of freeze-thaw and source of CO₂ production in the freeze-tolerant cricket *Gryllus veletis*" was recently published in the *Journal of Experimental Biology*. Graduating during the pandemic has changed my plans, but I was still able to perform research and work for the Loon Preservation Committee this past summer. I am hoping eventually to go to graduate school, but I am trying to gain experience in many different fields first so I can be sure I focus on the field in which I am most interested. This summer I'm excited to be heading to Manu National Park in Peru to study how climate change is affecting the range and movements of Spectacled Bears.

Elsa Godtfredsen '19

Hi, my name is Elsa Godtfredsen and I graduated from Colorado College in 2019. When I was at CC, I worked in Shane Heschel's lab on untangling the relationship between flower color and UV protection in *Ipomopsis aggregata* which involved a lot of summer field work at the Manitou Experimental Forest (the best!). After I graduated, I couldn't quite get myself to leave Colorado quite yet and so I started to work for the Department of Agriculture in Fort Collins CO. While I was there, I conducted field work on the Conservation Reserve Program which was mainly me crouching in restored farmland watching bees and counting thousands of flowers. I took a bit of a break from traditional plant science after leaving the USDA and lived on an organic farm in Kauai, Hawaii for a few months trying my hand at growing plants instead of studying them. I couldn't stay away for long although and found myself back in CO that summer studying changing flower phenology, duration, and pollination in the alpine wonders around Alma, CO for the Mountain Area Land Trust. Which leads me to now! I am currently a first year PhD student at the Plant Biology and Conservation program at Northwestern University and the Chicago Botanical Garden. I am in Amy Iler's lab and plan to return to Colorado to conduct my first year of my dissertation research on the effect of early snowmelt on plant physiology, survival and reproduction at the Rocky Mountain Biological Laboratory in Gothic, CO. I am slowly filling my Chicago apartment with thousands of house plants to make up for the cold so am definitely excited for another Colorado summer. I love to hear from CC students or grads so please feel free to reach out via email.



Jordan Ellison '19



Jordan with a Flammulated Owl nestling in the Manitou Experimental Forest – Summer 2019

Since graduating from CC, I've been able to travel working various field technician jobs. From counting and trapping migrating raptors on top of a mountain in Central Washington to a 6-month conservation internship in Northwest Mexico, my experiences at CC prepared me to carve out my own path and find my place in ecology and ornithology. I'm particularly grateful to the opportunities I had to do research while at CC—from field work in classes to 3 years of Flam Crew with Brian Linkhart. These experiences allowed me to figure out what I want to do in life and set me up for success in the job market after college. I am now beginning my MS in Fish, Wildlife and Conservation Ecology at New Mexico State University. Searching for and beginning graduate school in the midst of a pandemic has been a pretty odd experience, but don't get discouraged, the technician and graduate assistantship positions are still out there!

Whether you're searching for work or a graduate school position, the best advice I can give to a student is to constantly search for any and all opportunities to compliment your experiences. For example, I used my senior thesis as an opportunity to learn to code in R. Nobody told me to apply for a free student membership to my current professional society or participate in a

graduate school Diversity Preview Weekend at Cornell University. If you know what you're interested in, seek it out. Persistence is key in our area of work so don't give up! If you are looking to go down the path of research and graduate school, finding a home in a professional society and attending conferences is one great way to begin networking. With the transition to online conferences due to the pandemic, many meetings are now much more accessible than before, with many even offering free registration. Though I will admit the networking is a little bit different than at an in-person meeting, I've still been able to make new connections with various peers and professors in my field.

My last piece of advice is to market yourself. One thing I've done that has helped highlight my work and advertise myself as a young scientist is create a website. On my website, I'm able to share some samples of the work I've done and share my CV. I'd be more than happy to share some tips so please feel free to shoot me an email if you have any questions about anything at all or if you'd simply like to connect.



We hope you enjoyed reading faculty, staff, student, and young alumni updates from the OBE Department! If you're interested in keeping up with the department throughout the year, you can follow us on Instagram (@obe_coloradocollege) and check out some of the virtual field trip and lab videos we've made on our YouTube channel (*Colorado College OBE*).