

LEO PERCY CARPENTER

Department of Entomology
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EDUCATION

- M.S. Entomology Specialization in Pollination Biology, Insect Behavior and Ecology
Martin-Gatton College of Agriculture, Food and the Environment
University of Kentucky, Lexington, KY. Department of Entomology
Advisor: Dr. Beryl Jones
- B.S. Environmental and Evolutionary Biology, Cum Laude with Honors
College of Natural and Applied Sciences GPA: 3.73
Missouri State University, Springfield, MO. Presidential Scholar, Honors College
Advisor: Tina Hopper

RESEARCH INTERESTS

I am a first-year graduate student at University of Kentucky, working in Dr. Jones' laboratory studying bumble bee pollination, behavior, health, and agricultural applications. I graduated from Missouri State University in Environmental and Evolutionary Biology where I conducted pollinator behavioral and ecology research in the Russell Lab.

GRANTS, AWARDS, & HONORS**GRANTS & FELLOWSHIPS**

Graduate Research Assistantship University of Kentucky	\$29,000	Summer 2025
Beta Beta Beta Biology Honors Society Research Grant	\$1,000	Fall 2024
University of Illinois Chicago CIM2AS (Cultural Immersion in Monarchs & Milkweeds Advancing Science Education) Undergraduate Research Fellowship	\$5,000	Summer 2023
Beta Beta Beta Biological Honors Society Research Grant	\$268	Fall 2022

AWARDS & HONORS

College of Natural and Applied Sciences Undergraduate Research Symposium Second Place in Biology: Wildlife/Ecology	\$50	Spring 2024
Entomological Society of America President's Prize Second Place Undergrad Competition SysEB: Biodiversity 2		Fall 2023
Missouri State University SGA Commissioner of the Month		Spring 2023
MSU Presidential Honors Tuition and Housing Scholarship	\$38,000	Fall 2021 – May 2025
Missouri State University Dean's List		Fall 2021 – May 2025
Missouri State University Bright Flight Scholarship	\$12,000	Fall 2021 – May 2025

PUBLICATIONS

Leo Carpenter, Charles Stephen. (in preparation). A new species of *Hesperochnes* (Pseudoscorpiones: *Chernetidae*) in Oregon from burrows of Mountain Beaver (Mammalia: *Aplodontidae*: *Aplodontia rufa*). Missouri State University, Springfield, MO.

Ekemezie, S.C., Davis, C.C., Russo, M.V., **Carpenter, L.P.**, Russell, A.L. 2025. Pollen-microbe interactions in nectar weakly influence bee foraging behavior. *Integrative and Comparative Biology*. doi:10.1093/icb/icaf017

RESEARCH PRESENTATIONS

Leo Carpenter, Oscar Peterson, Marco Russo, Christopher Martine, Avery Russell. Fool Me Once: Successful Mimicry in a Cryptically Dioecious Plant Species despite Bee Learning. May 2025. *Missouri State University, College of Natural and Applied Undergraduate Research Symposium*, Springfield, MO. (poster)

Leo Carpenter, Oscar Peterson, Marco Russo, Christopher Martine, Avery Russell. April 2025. Fool Me Once: Sterile pollen Allows Effective Mimicry in Cryptic Dioecy, But Bees Learn. *Missouri Academy of Sciences Annual Research Meeting*, University of Central Missouri. (oral presentation)

Marco Russo, Mario Vallejo-Marín, Avery Russell, **Leo Carpenter.** March 2025. Consequences of Anther Morphology for Bee Pollen Collection and Pollen Transfer. *Tri-Beta Biology Honors Society Regional Convention*, Saint Louis University, Steelville, MO. (poster)

Leo Carpenter, Charles Stephens. April 2024. A new species of *Hesperochnes* (Pseudoscorpiones: Chernetidae) in Oregon from burrows of Mountain Beaver (Mammalia: Aplodontidae: *Aplodontia rufa*). *Missouri State University, College of Natural and Applied Undergraduate Research Symposium*, Springfield, MO. (poster)

Leo Carpenter, Charles Stephen. November 2023. A new species of *Hesperochnes* (Pseudoscorpiones: Chernetidae) in Oregon from burrows of Mountain Beaver (Mammalia: Aplodontidae: *Aplodontia rufa*). *Entomological Society of America Annual Research Conference*, Washington, DC. (poster)

Leo Carpenter, Morgan Blanton, David Zaya, Desiree Batista, Mary Ashley. August 2023. Impacts of Arthropod Interactions on Survival of Monarch. Butterflies' Eggs and Larvae. *University of Illinois Chicago, CIMAS Presentation*, Chicago, IL. (poster)

Leo Carpenter. March 2021. Concentration Toxicity Impact of Microsynthetic Materials on Filtration Behavior of Invasive *Corbicula fluminea*. *Junior Academy of Science*, Springfield, MO. (oral presentation)

Leo Carpenter. March 2020. Comparing the Impacts of Microfibers and Microplastics on *Corbicula fluminea* Filtration. *Ozarks Science and Engineering Fair*, Springfield, MO. (poster)

Leo Carpenter. March 2019. Establishing Evolutionary Relationships between Ten Native Eastern American Conifers through DNA Comparison. *Ozarks Science and Engineering Fair*, Springfield, MO. (poster)

RESEARCH PROJECTS

Leo Carpenter, Beryl Jones. 2025 – Current. **Integrative Analysis of Nutritional Stress on Bumble Bee Health in Agroecosystems.** University of Kentucky, Lexington, KY.

Leo Carpenter, Oscar Peterson, Marco Russo, Christopher Martine, Avery Russell. 2024 – 2025. **The Impact of Cryptic Dioecy in Solanum flowers altering Bumblebee Behavior.** Missouri State University, Springfield, MO.
We examined bumblebees' preferences for both varying sexual morphological floral traits as well as their preferences related to sex and pollen reward relationships through laboratory experimentation.

Marco Russo, Mario Vallejo-Marín, Avery Russell, Leo Carpenter. 2024 – 2025. **How Anther Dehiscence Affects Pollen Fate.** Missouri State University, Springfield, MO.

We evaluated how patterns of anther dehiscence between complete and poricidal affect pollen fate, relative to poricidal anthers.

Leo Carpenter, Charles Stephen. 2022 – Current. **A new species of *Hesperochnes* (Pseudoscorpiones: Chernetidae) in Oregon from burrows of Mountain Beaver (Mammalia: Aplodontidae: *Aplodontia rufa*).** Missouri State University, Springfield, MO.

We provide a complete species description that includes illustrations of both sexes, immature stages, and egg sacs; measurements; and a diagnostic key separating the new species from the two described. Notes are also provided on potential interactions with Mountain Beaver and other potential burrowing mammals. Dr. Charles Stephen is the mentor and the research advisor for this study. Attended Entomological Society of

America 2023, at National Harbor, MD. Received funding through Tri-Beta Biological Honors Society Research Grant.

Moth T. Castagna, Success Ekemezie, Jenny Burrow, Rita Afagwu, Leo Carpenter, Avery Russell. 2022- 2024. **How relative abundance of bumble bee species are influenced by floral community composition in prairie ecosystems.** Missouri State University, Springfield, MO.

Field research assessing bumble bee and flowering plant biodiversity. This study aimed to survey and document bumble bee distribution, abundance, and diversity and its relation to host plant abundance and diversity in southwestern Missouri prairies. Funded by Missouri Department of Conservation.

Success Ekemezie, Charlotte Davis, Marco Russo, Leo Carpenter, Avery Russell. Fall 2023 – Summer 2024. **Do pollen nutrients released by microbes into nectar affect bumble bee behavior?** Missouri State University, Springfield, MO.

We investigated how yeast (*Metschnikowia reukaufii*) and bacteria (*Acinetobacter nectaris*), commonly found in nectar, affected pollen germination and whether nectar-microbe-pollen interactions modified bumble bee foraging behavior. We found that both bacteria and yeast induced pollen germination in artificial nectar, with bacteria inducing the most germination. Although pollen nutrients are recognized to affect the growth of nectar microbes, which might in turn affect natural floral cues, our work suggests pollen-microbe interactions alone may be insufficient to affect pollinator behavior.

Leo Carpenter, Morgan Blanton, David Zaya, Desiree Batista, Mary Ashley. 2023. **Impacts of Arthropod Interactions on Survival of Monarch Butterflies' Eggs and Larvae.** University of Illinois Chicago, Chicago, IL.

Co-author on a study focusing on the interactions between monarch neonates (eggs and larvae) and other arthropods in milkweed plants. We used our observational data where swamp and butterfly milkweed were planted at sites around Chicago and monitored throughout the summer. We also examined previous undergraduate researchers' data collected, including 23 site locations and over 70 observations. Research was supported through the CIMAS Undergraduate Research Internship at the University of Illinois Chicago.

Leo Carpenter, Taylor Hiers, Hannah Robinson, Daniel Andrews. 2022. **Beginner's guide to North American Cave Arthropod identification: Arachnida, Diplopoda, and Diptera.** Missouri State University, Springfield, MO.

Co-author on a research paper about cave arthropod identification in the US; mentored by Dr. Charles Stephen; headed pseudoscorpion analysis, preservation, and description, photographed specimens; Created an introduction to cave arthropod identification for beginners in this field.

Leo Carpenter, Allison Seija, Chris Barnhart. 2022. **Invasive Freshwater Mussel (*Corbicula fluminea*) Filtration Effects on Native Deertoe Mussel's Spermatozuogmata (*Truncilla truncata*).** Missouri State University, Springfield, MO.

Studied invasive bivalves and how they filtered native bivalves spermatozuogmata; tested different preservation techniques of spermatozuogmata; conducted cell counter calculations, and turbidity tests, and compared photographs of the solution over time; processed and organized data.

Leo Carpenter, Chris Barnhart. 2020 - 2021. **Concentration Toxicity Impact of Microsynthetic Materials on Filtration Behavior of Invasive *Corbicula fluminea*.** Greenwood Laboratory School, Springfield, MO.

Analyzed invasive bivalves filtration of microsynthetic materials; compared filtration rates and behavioral activities; measured temperature, behavior, turbidity, and microscopic particle observation; compiled findings in two papers: one focusing on filtration of microplastics, another focusing on filtration and behavioral relations of differing microparticles.

Leo Carpenter. 2019. **Establishing Evolutionary Relationships between Ten Native Eastern American Conifers through DNA Comparison.** Greenwood Laboratory School, Springfield, MO.

Compared DNA analysis of native eastern American conifers using PCR and gel electrophoresis; took verified plant samples from local arboretum; processed DNA samples; analyzed the base pairs and correlating genes; created a phylogenetic tree.

RESEARCH POSITIONS

Graduate Research Assistant, with Dr. Beryl Jones, University of Kentucky, Lexington KY Current position, assisting in examining bee health and environmental impacts	June 2025 – Current
Undergraduate Research Assistant, with Dr. Avery Russell, Missouri State University, Springfield MO Developed, set up and ran behavioral observational experiments to assess bumblebee behavior and learning ability with graduate and undergraduate students. Discussed about bumblebee enrichment effects on bumblebee behavior, memory and learning with lab members and brainstormed ways to adapt experiments. Examining bumblebee and microbial interactions altering behavior, memory, and learning through shared projects. Reviewing observational video trials, inputting data, organizing trial videos to provide easy access and eliminate user error. Attending weekly lab meetings for topic discussions, practice presentations, motivating each other, and working together to solve experimental or academic problems. Trained newer laboratory members on behavioral experimental procedures, bumblebee handling, recording behavioral data, and organizing laboratory materials and data.	August 2023 – May 2025
Summer Field Research Associate, with Dr. Avery Russell, Missouri State University, Springfield MO Field research assessing bumble bee and flowering plant biodiversity. This study aimed to survey and document bumble bee distribution, abundance, and diversity and its relation to host plant abundance and diversity in southwestern Missouri prairies. Responsible for identifying native and invasive flora, surveying Missouri prairies plants, and collecting and identifying bumble bees while maintaining accurate documentation and data entry. Coordinated with two graduate students on sampling locations, weather, habitat, and problem-solving. Funded by Missouri Department of Conservation.	May 2024- August 2024
Undergraduate Researcher, with Desiree Batista, University of Illinois Chicago, Chicago, IL Designed and executed observational experiments to assess arthropod abundance and exposure to monarch butterfly' neonates in local Chicagoland area. Collaborated with other researchers to further our understanding of monarch butterflies' ecology and biology as a whole. Analyzed data, wrote an overview of experimentation and results. Created research poster and presented results to community members. Assisted in over 200 experimental milkweed plantings in Chicago, observed and monitored milkweed sites for arthropods, milkweed survival, neonate survival, and monarch interactions. Conducted plant field sampling and arthropod observations. Learned basic steps of coding, analyzing, and reviewing data using R-Studio and Python (PyCharm CE).	May – Aug. 2023
Student Research Laboratory Assistant, With Dr. Chris Barnhart, Missouri State University, Springfield MO Developed, set up and ran lab experiments to assess native and invasive freshwater bivalves reproductive interference and interactions over several months. Analyzed data, wrote an overview of experimentation and results and presented to the lab and department head. Collaborated with the lab manager in analyzing and preserving freshwater bivalves' spermatozoa, as well as facilitating lab conditions to produce spermatozoa. Assisted with daily care and cleaning of freshwater bivalves, freshwater fish. Monitored mussels and fish health, growth, weight and survivability rates. Developed, set up and ran lab experiments to explore Great Spangled and Regal Fritillary butterflies' larvae 'hibernation' and survivability in different humidity levels. Reviewed techniques and larvae's' outcomes and how that plays into their hibernation.	September 2021- August 2022

TEACHING EXPERIENCE

Teaching Assistant, ENT 209: Bees and People, University of Kentucky Bees and People introduces students to bee biology, diversity, behavior, and basic beekeeping to teach students about scientific approaches in diverse areas of biology.	August – December 2025
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The course also addresses the ways in which scientific consensus is reached around controversial issues, particularly those that threaten bee populations. Assisting in classroom workshops, guiding student discussions, and answering student's questions.

PASS Mentor, BIO 515 Evolution, Missouri State University

BIO 515 Evolution introduces students to the field of evolutionary biology, focusing on theory, process, and pattern of evolutionary change. This course covers how genetic structure of a population changes in response to mutation, natural selection, gene flow, and genetic drift. Assisting in teaching students how to analyze evolutionary data (fossil records, molecular, morphological, etc.) and understand scientific language. Assisting in classroom duties, organizing study sessions, leading relevant discussions and activities to help students understand traditionally difficult course material. Currently, have mentored seventeen one-on-one students, and helped with three classes (over 70 students).

January 2024
– May 2025

Education and Animal Care Intern, National Tiger Sanctuary, Saddlebrook MO

Created internship and incoming volunteer manual and materials. Trained new interns and volunteers with enrichment, cleaning, maintenance, food preparation, and animal interactions. Conducted educational tram and walking tours to the public on facilities, conservation and wildlife education. Additional responsibilities included time spent in the main office organizing files, medical equipment, emergency equipment, and educational materials.

Sept 2021 –
May 2022

Undergraduate Researcher & Outreach Volunteer, Dr. Barnhart's Laboratory

Coordinated and educated retirement homes residents on native butterfly ecology, presented to residents several times, created educational handouts, and packaged monarch butterfly chrysalises to give residents to observe and release.

Sept 2021-
Aug 2022

Educational and Animal Care Intern, Wonders of Wildlife Aquarium and Museum

Assisted with educational programs for Elementary to High school students and school groups. Educational programs include leading dissections, introductory chemistry lab experimentation, outdoor survival demonstrations, outdoor cooking techniques, outdoor activity demonstrations (kayaking, canoeing, paddleboarding, archery) and ecological and conservation lessons. Created educational materials and assisted in creation of course materials and class plans. Instructed and created two outdoor cooking education and provided educational booklets for all attendees.

June 2014 –
March 2020

COMMUNITY ENGAGEMENT

Founder, Holidays in Hospitals, Springfield, MO

Founded and head a local nonprofit that provides mental health kits and holiday visits to patients, families, and hospital employees. Organizes and leads board meetings, volunteers, donation drives, and donation storage. Manages hospital and outreach communication. Visits patients and their visitors on holidays, gifting comfort and care items. Creating and packaging Mental Health Care kits for teenagers and during height of COVID lockdown, to COVID-19 patients.

2012 – 2024

Volunteer, Missouri State University, Springfield, MO

Executive Officer (May 2024- May 2025), President (May 2023 – May 2024), Students for a Sustainable Future, MSU

Students for a Sustainable Future aims to educate students on what sustainability really means, how it can be put into practice, and what its importance is. We organize stream clean ups, tree-plantings, sustainable crafting nights, documentary meetings, and collaborating with local organizations to better our community.

Fall 2021- Spring 2025

Fall 2022 – Spring 2025

Vice President, Publicity Coordinator, Tri-Beta Biological Honors Society

Beta Beta Beta (Tri-Beta) is an honor society for biology undergraduates, where we tour laboratories, take educational hikes, conduct bi-semester street clean ups and volunteer in the community.

Fall 2021 – Spring 2025

Sustainability Commissioner, Student Government Association, MSU

The Sustainability Commission is a student-run, student-led initiative designed to promote ecologically and environmentally friendly practices on Missouri State's campus. The commission receives

Fall 2022 – Spring 2024

funding each year from every student. The commissioners are tasked with evaluating student-submitted proposals and creating the future of sustainability on campus. Volunteering at environmental campus events and educational presentations. Presented a 20+ page, 69k proposal to further recycling initiatives on campus, accepted in Spring 2024 and currently being implemented.

Undergraduate Researcher, Dr. Barnhart's Laboratory, MSU

Fall 2021 - Fall 2022

Coordinated volunteer efforts with retirement homes to educate residents on native butterfly ecology, presented to residents several times, created educational handouts, and packaged monarch butterfly chrysalis's to give for residents to observe and release.

Volunteer, CIMAS Internship, University of Illinois Chicago, Chicago, IL

Summer 2023

Worked with local researchers and community leaders to educate community members on native plants and wildlife. Studied the cultural, social, and philosophical connections between monarch butterflies, migration, immigration, and growth. Coordinated with David Zaya, Desiree Batista, Mary Ashley, with UIC's campus garden, Pilsen neighborhood events and the Latino Culture Center at UIC.

RESEARCH PRESS

UIC CIM2AS Internship – introduction of research interns cohort

Summer 2023

URL: <https://cimas.uic.edu/profiles/carpenter-leo/>

CNAS NewsWatch – article and interview with Olivia Prost

Dec. 8th, 2022

URL: <https://blogs.missouristate.edu/cnas-newswatch/2022/12/08/naming-new-species-and-saving-the-bees/>

RELEVANT UNDERGRADUATE COURSEWORK

Evolution	Ecology	Cellular and Molecular Biology
Cave Biology	Principles of Sustainability	Biostatistics
Calculus	Organic Chemistry	Ecotoxicology
Entomology	Aquatic Entomology	Epigenetics and Human Health
Sustainable Management of Natural Resources	Writing Across the Disciplines	Genetics

CERTIFICATIONS

CITI: Responsible Conduct of Research	June 2025
CITI: Biomedical Researchers - Basic Course	September 2023
CITI: Biosafety and Biosecurity (BSS) - Basic Biosafety	August 2023
Suicide Prevention from the ASK Listen Refer	May 2022
CITI: Animal Care and Use. Wildlife Researcher	September 2021
CITI: Working With Fish in Research Settings. Lab Animal Research	September 2021
PADI: Advanced Open Water Diver	July 2020
PADI: Enriched Air Diver	July 2020
PADI: Open Water Diver	January 2020

PROFESSIONAL AFFILIATIONS

Member

Beta Beta Beta Biological Honors Society (BBB)

2022 - present

Entomological Society of America (ESA)

2022 – present

OTHER POSITIONS AND EXPERIENCES

Biology Department Greenhouse Care Taker

With Missouri State University, Springfield, MO

Responsible for managing Missouri State's Biology department's greenhouse.

Organizing and inventorying four different professors' lab and care supplies. Maintaining three separate climates and conditions for a variety of plant species. Upkeeping irrigation systems, evaporative cooling system, and climate control systems. Reporting pests outbreaks, safety concerns and plant health.

December
2023 – May
2025**Sustainability Coordinator's Assistant**

With Missouri State University, Springfield, MO

Researched and created educational presentations for recycling and materials for faculty, staff and students. Managed and promoted MSU's Sustainability social media pages, including graphic design, content creation, reporting sustainability events and projects locally and campus-wide. Designed educational recycling posters displayed permanently across campus to increase recycling and composting awareness. Planned and managed student sustainability events.

August 2022
– May 2023**Education and Animal Care Intern**

With the National Tiger Sanctuary, Saddlebrook, MO

Responsible for providing enrichment for a variety of animals. Assisted in cleaning and repairing animal habitats. Responsible for preparing meat, butchering, sorting, cleaning, weighing and placing supplements and medication within food for large cats.

Responsible for prepping vegetables, fruits and nuts for primates. Assisted in veterinarian exams including ultrasounds, vaccinations, dental exams, skin health, and necropsies.

Sept 2021 -
May 2022**Educational and Animal Care Volunteer and Intern,**

with Wonders of Wildlife, Springfield, MO

Responsible for animal care, cleaning, and feeding. Assisted in animal handling training for both the animals and humans.

Fall 2014–
March 2020