MICAH G. FREEDMAN

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PROFESSIONAL APPOINTMENTS

Assistant Professor	University of Toronto Dept. of Ecology & Evol. Bio. Toronto, ON Canada	July 2024-Present

EDUCATION AND TRAINING

Postdoctoral Fellow	University of British Columbia Dept. of Botany Vancouver, BC, Canada Supervisor: Dr. Amy Angert	2022-2024
NSF Postdoctoral Fellow	University of Chicago Dept. of Ecology & Evolution Chicago, IL USA Supervisor: Dr. Marcus Kronforst	2020-2022
Ph.D., Population Biology	University of California, Davis Dept. of Evolution and Ecology Davis, CA USA Advisors: Dr. Sharon Strauss, Dr. Santiago Ramírez Dissertation: Contemporary Evolution During Global Range Expansion in the Monarch Butterfly	2014-2020
Bachelor of Science	Cornell University College of Agriculture and Life Sciences Ithaca, NY USA Majors: Entomology, Plant Sciences	2009-2013

PEER-REVIEWED PUBLICATIONS

(*corresponding author; †equal contribution; ^undergraduate mentee)

Submitted

Hemstrom, W.B., **Freedman, M.G.**, Zalucki, M.P. & M.R. Miller. Novel genetic control of migratory diapause in Australian monarch butterflies. *In revision.*

Guizar-Amador, M.F., Linden, T.A., Cridland, J., Hetherington-Rauth, M., **Freedman, M.G.**, Saleh, N.W., Eltz, T., Pupulin, F., Zerbe, P., Dean, C.A. & S.R. Ramírez. Floral scent regulates fine-scale niche partitioning of bee pollinators and reproductive isolation among sympatric *Gongora* orchids.

Freedman, M.G.*, Choquette, S.^, Hunter, M.D., Strauss, S.Y., Ramírez, S.R. & R.L. Vannette. Population-specific patterns of cardenolide sequestration in monarch butterflies from around the world. Link to preprint: https://www.biorxiv.org/content/10.1101/2021.10.15.464593v2.

Published

Jaeger, S., **Freedman, M.G.**, Alexander, C.M., Hilpman, E.T., Weber, M.G. & E.F. LoPresti. Increased reliance on diurnal pollination in a geographically and morphologically atypical sand verbena. *Journal of Pollination Ecology* 38, 58-75. doi.org/10.26786/1920-7603(2025)824.

Freedman, M.G.*, Long, R.W., Ramírez, S.R. & S.Y. Strauss (2024). Evidence for reductions in physical and chemical plant defense traits in island flora. *Plants* 13, 1026. doi.org/10.3390/plants13071026.

- Cover feature for the April 2024 issue

Freedman, M.G.* & M.R. Kronforst (2023). Migration genetics take flight: genetic and genomic insights into monarch butterfly migration. *Current Opinion in Insect Science* 59, 101079. doi.org/10.1016/j.cois.2023.101079.

Robinson, M.L., Weber, M.G., **Freedman, M.G.**, Ashlock, S., Jordan, E., Yonenaga, J. & S.Y. Strauss (2023). Broadscale evolution of coloration in caterpillars reflects their interactions with plants and supports classic tenets of plant defense theory. *Proceedings of the Royal Society B* 290, 20222293. doi.org/10.1098/rspb.2022.2293.

- Cover feature for the January 2023 issue

Hemstrom, W.B., **Freedman, M.G.†*,** Zalucki, M.P., Ramírez, S.R. & M.R. Miller (2022). Population genetics of a recent range expansion in monarch butterflies. *Molecular Ecology* 31, 4544-4557. doi.org/10.1111/mec.16592.

Pocius, V.M., Majewska, A.A. & **M.G. Freedman** (2022) The role of experiments in monarch butterfly conservation: a review of recent studies and approaches. *Annals of the Entomological Society of America* 115, 10-24. doi.org/10.1093/aesa/saab036

Freedman, M.G.*, De Roode, J.C., Forister, M.L., Kronforst, M.R., Pierce, A.A., Schultz, C.B., Taylor, O.R. & E.E. Crone (2021). Are eastern and western monarch butterflies distinct populations? A review of evidence for ecological, phenotypic, and genetic differentiation and implications for conservation. *Conservation Science and Practice*, 3:e432. doi.org/10.1111/csp2.432

- Cover feature for the July 2021 issue

Freedman, M.G.*, Dingle, H., Strauss, S.Y. & Ramírez, S.R (2020). Two centuries of monarch butterfly collections reveal contrasting effects of range expansion and migration loss on wing traits. *Proceedings of the National Academy of Sciences, USA* 117, 28887-28893. doi.org/10.1073/pnas.2001283117.

- Featured by UC Davis, San Jose Mercury News, Santa Cruz Sentinel, East Bay Times, Davis Enterprise

Freedman, M.G.*, Jason, C.^, Ramirez, S.R. & S.Y. Strauss (2020). Host plant adaptation during contemporary range expansion in the monarch butterfly. *Evolution* 74, 377-391. doi.org/10.1111/evo.13914.

Freedman, M.G.* & H. Dingle. (2018). Wing morphology in migratory North American monarchs: characterizing sources of variation and understanding changes through time. *Animal Migration* 5, 61-73. doi.org/10.1515/ami-2018-0003

- Featured by National Geographic and as part of a television production by the Japanese National Broadcasting Corporation (NHK)

Freedman, M.G.*, Miller, R.H. & H.S. Rogers. (2018). Landscape-level bird loss increases the prevalence of honeydew-producing insects and invasive ants. *Oecologia* 188, 1263-1272. doi.org/10.1007/s00442-018-4273-5.

Freedman, M.G.*, Dingle, H., Chiu, J.C., Tabuloc, C. Yang, L.H. & M.P. Zalucki. (2018). Non-migratory monarch butterflies retain developmental and transcriptional mechanisms associated with migration. *Biological Journal of the Linnean Society* 123, 265-278. doi.org/10.1093/biolinnean/blx148.

FUNDED RESEARCH PROPOSALS

Effects of climate change, migratory plasticity, and habitat modification on monarch butterfly migration. Funded jointly by the Canada Foundation for Innovation John R. Evans Leaders Fund (CFI-JELF) and the Ontario Research Fund (ORF). Total award amount: **$400,000**.

Effects of climate change, migratory plasticity, and host plant availability on monarch butterfly migration patterns. Discovery Grants Program, NSERC. 2024-2028. **$225,000**.

Using stable isotopes and cardenolide fingerprinting to identify natal origins of western monarch butterflies. Co-PI with Drs. Louie Yang, Emily Meineke, and Chris Funk. 2022-2025. **$19,250**. Awarded by the United States Fish and Wildlife Service.

FELLOWSHIPS AND AWARDS

NSF Postdoctoral Research Fellowship in Biology - **$138,000**	**2020-2022**
Center for Population Biology Summer Research Award - **$1,693**	**2019-2020**
Center for Population Biology Summer Research Award - **$1,700**	**2018-2019**
Center for Population Biology Summer Research Award - **$1,800**	**2017-2018**
National Geographic Society Exploration Grant - **$4,750**	**2017-2018**
NSF EAPSI Australia Fellowship - **$5,400**	**2016**
SSE Rosemary Grant Award - **$2,250**	**2016-2017**
Mildred E. Mathias Research Award - **$2,752**	**2016-2017**
Center for Population Biology Summer Research Award - **$1,800**	**2015-2016**
National Science Foundation Graduate Research Fellowship	**2015-2019**
Davis Botanical Society Award - **$1,690**	**2015-2016**
Hunter Rawlings Cornell Presidential Research Scholarship - **$32,000**	**2009-2013**
Garden Club of America Summer Environmental Scholarship - **$2,000**	**2011**

INVITED SEMINARS AND LECTURES

“Causes and consequences of host plant specialization in monarch butterflies and other Lepidoptera.” Invited Seminar, University of Toronto, Mississauga, Department of Ecology and Evolutionary Biology, January 31, 2025.

“Global range expansion and niche breadth evolution in an iconic insect species.” Invited seminar, University of Michigan, Department of Ecology and Evolutionary Biology, December 5, 2024.

"Host specialization and toxin sequestration in monarch butterflies." Invited seminar, University of Rochester, Department of Biology, November 15, 2024.

"Global range expansion and niche breadth evolution in an iconic insect species." Invited seminar, University of Toronto, Department of Ecology & Evolutionary Biology, March 20, 2023.

"Host plant adaptation and toxin sequestration in monarch butterflies (*Danaus plexippus*)." Invited seminar, Auburn University, Department of Entomology & Nematology, February 20, 2023.

"Global range expansion, loss of migration, and adaptation in the monarch butterfly (*Danaus plexippus*)." Invited seminar, University of Colorado Denver, Department of Integrative Biology, October 7, 2022.

"Toxin sequestration and its importance in plant-animal interactions." Invited guest lecture for EEB440: Ecology and Evolution of Plant-Animal Interactions, University of Toronto, September 23, 2022.

"Global range expansion in the monarch butterfly: ecological and evolutionary implications." Invited seminar, University of Illinois at Chicago Department of Biological Sciences, October 26, 2021.

"Contemporary evolution during global range expansion in the monarch butterfly." Eco-Evo Lunch Seminar Series, Stanford University, March 3, 2020.

"Contemporary evolution of monarch butterflies in North America and abroad." Invited seminar, Iowa State University Department of Ecology, Evolution, and Biodiversity, December 12, 2019.

"The ecology and evolution of monarch butterflies on Pacific islands." POETS seminar series, University of Guam, June 1, 2018.

CONFERENCE PRESENTATIONS

Freedman, M.G., Hemstrom, W.B., Zalucki, M.P., Ramírez, S.R. & M.R. Miller. Using population genomics to infer the trans-Pacific range expansion of monarch butterflies (Danaus plexippus). Remote presentation for the 2025 Mariana Islands Conservation Conference, Guam.

Freedman, M.G. Using chemical fingerprinting to understand host choice and migration biology in western North American monarch butterflies. Poster presentation at the 2025 Gordon Conference for Plant-Herbivore Interactions, Pomona, CA.

Freedman, M.G. Using chemical fingerprinting techniques to study monarch butterfly ecology. Oral presentation at the 2024 Ontario Entomological Society Meeting, Scarborough, ON.

Freedman, M.G. Are dispersal ability and geographic range size correlated? An empirical test with milkweeds (*Asclepias spp.*). Oral presentation at the 2024 Canadian Society for Ecology and Evolution Meeting, Vancouver, BC.

Freedman, M.G. Monarch butterflies differ in their sequestration of milkweed cardenolides. Poster presentation at the 2023 Gordon Conference for Plant-Herbivore Interactions, Ventura, CA.

Freedman, M.G. Using cardenolide fingerprints to infer natal origins and migratory patterns in western North American monarch butterflies. Invited oral presentation at the 2023 Western Monarch Advocates Summit, San Luis Obispo, CA.

Freedman, M.G., Agrawal. A.A., Hastings, A.P., Papa, R. & M.R. Kronforst. Functional genomics of cardenolide sequestration in monarch butterflies (*Danaus plexippus*). Oral presentation at the 2022 Entomological Society of America Meeting, Vancouver, BC.

Freedman, M.G., Choquette, S., Hunter, M.D., Strauss, S.Y., Ramírez, S.R. & R.L. Vannette. Population-specific patterns of cardenolide sequestration in monarch butterflies from around the world. Oral presentation at the 2022 Evolution Meeting, Cleveland, OH.

Freedman, M.G., Hemstrom, W.B., Miller, M.R., Zalucki, M.P., Ramírez, S.R. & S.Y. Strauss. Standing genetic variation in monarch butterflies and its conservation implications. Invited oral presentation at the 2019 Entomological Society of America Meeting, Saint Louis, MO.

Freedman, M.G., Jason, C., Ramirez, S.R. & S.Y. Strauss. Host plant adaptation during global range expansion in the monarch butterfly. Oral presentation at the 2019 Evolution Meeting, Providence, RI.

Freedman, M.G., Jason, C., Ramirez, S.R. & S.Y. Strauss. Host plant adaptation during global range expansion in the monarch butterfly. Poster presented at the 2019 Gordon Conference on Plant-Herbivore Interactions, Ventura, CA.

Freedman, M.G. Parallel loss of defenses against ungulate herbivores in chaparral shrubs from the Channel Islands, California, USA. Oral presentation at the 2017 Ecological Society of America Meeting, Portland, OR.

Freedman, M.G. Contemporary evolution of monarch butterflies in their introduced range. Oral presentation at the 2017 Evolution Meeting, Portland, OR.

Freedman, M.G., Miller, R.H. & H.S. Rogers. Assessing the importance of "unwanted" mutualisms between invasive ants and honeydew-producing insects in native forests of the Northern Mariana Islands. Poster presented at the 2014 Ecological Society of America Conference, Sacramento, CA.

Freedman, M.G., Campbell, S.A., Halitschke, R. & A. Kessler. Evolution of reduced floral scent emission under multiple independent transitions from outcrossing to selfing in the wild nightshades (Solanaceae). Poster presented at the 2014 Gordon Conference on Plant Volatiles, Ventura, CA.

REVIEWER EXPERIENCE

Manuscript reviews:

- *Proceedings of the National Academy of Sciences USA (x2)*
- *Cell*
- *Evolution Letters*
- *Molecular Ecology*
- *Ecology*
- *New Phytologist*
- *Biological Invasions*
- *Journal of Biogeography*
- *Ecology and Evolution*
- *Scientific Reports*
- *Ecological Entomology*
- *Journal of Tropical Ecology*
- *Journal of Thermal Biology*
- *Journal of Tropical Biology and Conservation*
- *Frontiers in Ecology and Evolution*

Funding proposal reviews:

- European Research Council ad hoc review (2022)
- National Geographic Explorer Award (2022)

TEACHING EXPERIENCE

Instructor: EEB380 – Insect Diversity (U of T) Fall 2025
Instructor: EEB405 – Temperate Field Biology (U of T) Spring 2025
Instructor: EEB495 – Seminar in Ecology and Evol. Biol. (U of T) Winter 2025
Instructor: EEB440 – Plant-Animals Interactions (University of Toronto) Fall 2024

Teaching Assistant: EVE 100 – Introduction to Evolution (UC Davis) Fall 2019
Assistant instructor: UC Davis R Bootcamp Winter 2017
Reader: EVE 181 – Plant-Animal Interactions (UC Davis) Fall 2016
Reader: EVE 101 – Introduction to Ecology (UC Davis) Spring 2016
Teaching assistant: EVE 100 - Introduction to Evolution (UC Davis) Fall 2015

MENTORSHIP

Ph.D students:

- Adam Lee (University of Toronto), 2024-present

Postdoctoral mentees:

- Benjamin Pyenson (University of Toronto), 2024-present

Thesis committees:

- Aidan Godin (M.Sc. defense, University of Toronto), 2025
- Anahy Garza (Ph.D. student, University of Toronto), 2025-present
- Hayden Fargo (Ph.D. student, University of Toronto), 2024-present
- Juniper Malloff (Ph.D. student, University of Toronto), 2023-present
- Christiana-Jo Quintana, M.Sc. (Iowa State University), 2022

Appraisal examination committees:

- Juniper Malloff (Ph.D. student, University of Toronto), April 2025
- Youngseo Jeong (Ph.D. student, University of Toronto), March 2025
- Louisa Bartkovich (Ph.D. student, University of Toronto), December 2024
- Christopher Carlson (Ph.D. student, University of Toronto), November 2024

Undergraduate mentees:

- Yuliia Hrytskiv (University of Toronto)
- Liz Lo (University of Toronto)
- Tara McGruder (University of Toronto)
- Fangming Teng (University of Toronto)
- Deep Singha (UBC)
- Vanessa Chen (UBC)
- Annabelle Damude (UBC)
- Asia Jones (UC Davis)
- Christopher Jason (UC Davis)
- Sue-Ling Choquette (UC Davis)
- Chandler Puritty (Howard University)
- Nia Johnson (Howard University)
- Anika Hamilton (Howard University)

Graduate Student Mentor: UC Davis EEGAP (Evolution and Ecology Graduate Admissions Pathways) partnership with Howard University**,** UC Davis SEEDS (Strategies for Ecology Education, Diversity, and Sustainability) undergraduate club

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SERVICE ACTIVITIES

Professional service activities:

- Workshop participant, review of IUCN Red List assessment for the monarch butterfly (*Danaus plexippus*), December 2022

Outreach activities:

- Public lecture, Brodie Club at the University of Toronto (2025)
- Invited speaker for CIM^{2}AS student interns at University of Illinois, Chicago (2022)
- Presentation to the Jackson Park Advisory Council on monarch butterfly conservation, Chicago (2021)
- Panel participant on how to find a postdoc (2021 Evolution meeting)
- Volunteer at UC Davis Picnic Day (2015, 2018, 2019)
- UC Davis Biodiversity Museum Day (2019)
- UC Davis BioBlitz (2016)
- Science Exploration Day, Chabot Space and Science Center, Oakland, CA (2017)

PROFESSIONAL MEMBERSHIPS

Entomological Society of America	October 2019 - Present
Society for the Study of Evolution	March 2015 - Present
Ecological Society of America	August 2014 – Present