

RODNEY TREY RICHARDSON

Assistant Professor
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I. EDUCATION

2013 B.Sc., Indiana University, Biochemistry
2018 Ph.D., Ohio State University, Entomology

II. APPOINTMENTS

2018-2020 Postdoctoral Scholar, York University
2020-present Assistant Professor, UMCES Appalachian Laboratory

III. RESEARCH (Researcher ID: publons.com/a/1232377/)

A. Area of professional expertise

Application of molecular techniques to the study of ecological and environmental research questions, including advancing novel molecular ecological techniques and developing associated bioinformatic infrastructure. Particular emphasis on understanding the impacts of recent land use changes, including urbanization, agricultural intensification and reforestation, on pollinator health.

B. Publications (* indicates undergraduate advisee co-author)

1. Peer-reviewed publications

Lin, C-H, DB Sponsler, RT Richardson, HD Watters, DA Glinski, WM Henderson, JM Minucci, EH Lee, ST Purucker & RM Johnson. (2021) Honey bees and neonicotinoid-treated corn seed: Contamination, exposure, and effects. *Environmental Toxicology and Chemistry*, 40: 1212-1221

Richardson, RT, G Cherry*, C-H Lin, TD Eaton, RM Johnson & DB Sponsler. (2021) Application of plant metabarcoding to identify diverse honeybee pollen forage along an urban–agricultural gradient. *Molecular Ecology*, 30: 310-323

McMinn, H, RT Richardson, TD Eaton, M Smith & RM Johnson. (2020) Quantifying honey bee utilization of Conservation Reserve Program (CRP) pollinator plantings using DNA metabarcoding. *Insects*, 11: 405

Richardson, RT, DB Sponsler, H McMinn-Sauder & RM Johnson. (2020) MetaCurator: A hidden Markov model-based toolkit for extracting and curating sequences from taxonomically-informative genetic markers. *Methods in Ecology and Evolution*, 11: 181-186

Sponsler, DB, D Shump, RT Richardson & C Grozinger. (2020) Characterizing the floral resources of a North American metropolis using a honey bee foraging assay. *Ecosphere*, 11: e03102

- Sponsler, DB, C Grozinger, RT Richardson, D Brough, A Nurse & KA Stoner. (2020) A screening-level assessment of the pollinator-attractiveness of ornamental nursery stock using a honey bee foraging assay. *Scientific Reports*, 10: 831
- Richardson, RT, HR Curtis*, EG Matcham, C-H Lin, S Suresh, DB Sponsler, L Hearon* & RM Johnson (2019) Quantitative multi-locus metabarcoding and waggle dance interpretation reveal honey bee spring foraging patterns in Midwest agroecosystems. *Molecular Ecology*, 28: 686-697
- Richardson, RT, J Bengtsson-Palme, MM Gardiner & RM Johnson (2018) A reference cytochrome c oxidase subunit I database curated for hierarchical classification of arthropod metabarcoding data. *PeerJ*, 6: e5126
- Bengtsson-Palme, J, RT Richardson, M Meola, et al. (2018) Metaxa2 Database Builder: enabling taxonomic identification from metagenomic or metabarcoding data using any genetic marker. *Bioinformatics*, 34: 4027-4033
- Richardson, RT, MN Ballinger, F Qian, JW Christman & RM Johnson (2018) Morphological and functional characterization of hemocyte communities spanning the honey bee, *Apis mellifera*, lifecycle. *Apidologie*, 49: 397-410
- Richardson, RT, J Bengtsson-Palme & RM Johnson (2017) Evaluating and optimizing the performance of software commonly used for the taxonomic classification of DNA metabarcoding sequence data. *Molecular Ecology Resources*, 17: 760-769
- Bell, KL, N de Vere, A Keller, RT Richardson, A Gous, KS Burgess & BJ Brosi (2016) Pollen DNA barcoding: Current applications and future prospects. *Genome*, 59: 1-12
- Richardson, RT, C-H Lin, JQ Quijia*, NS Riusech, K Goodell & RM Johnson (2015) Rank-based characterization of pollen assemblages collected by honey bees using a multi-locus metabarcoding approach. *Applications in Plant Sciences*, 3: 1500043
- Richardson, RT, C-H Lin, JO Quijia*, DB Sponsler, K Goodell & RM Johnson (2015) Application of ITS2 metabarcoding to determine the provenance of pollen collected by honey bees in a field-crop dominated agroecosystem. *Applications in Plant Sciences*, 3: 1400066

2. Conference proceedings and outreach articles

- Richardson, RT. (2018) What would be the single best policy for improving the health of *Apis mellifera* if adopted worldwide? In International Congress of Entomology student debates: Unbiased introduction. *American Entomologist* 64: 165-175
- Richardson, RT, MN Ballinger, Qian F, Christman JW & Johnson RM. (2017) Morphological and functional characterization of honey bee hemocytes. In Proceedings of the 2017 American Bee Research Conference. *Bee World* 93: 104-127

Richardson, RT, C-H Lin, JO Quijia, NS Riusech, K Goodell & RM Johnson. (2015) Pollen analysis: Is metabarcoding the next generation? *In* Scientific abstracts from the 6th International Barcode of Life Conference. *Genome* 58: 163-303

Johnson, RM, RT Richardson & C-H Lin. (2016) *Nosema* testing results from the OSBA fall conference. *Ohio State Beekeepers Association Newsletter* 4: 17-18

Richardson RT & RM Johnson. (2014) Immune consequences of insecticide exposure from corn seed treatment dust. *Ohio State Beekeepers Association Newsletter* 3: 10

C. *Ad hoc* peer reviews and professional service

- *Ad hoc* reviews by journal and subject area:
 - Metabarcoding methods: *Molecular Ecology Resources* (7x), *Evolutionary Applications*, *PLoS One* (3x), *Palynology*, *Aerobiologia*, *BMC Ecology*, *Bioinformatics and Biology Insights*
 - Applied ecology using metagenetics: *Communications Biology* (2x), *Molecular Ecology* (3x), *Frontiers in Ecology and the Environment*, *Genome*, *Ecology and Evolution*, *Environmental Entomology* (2x), *Global Ecology and Conservation*, *Ecological Solutions and Evidence*
 - Honey bee toxicology and physiology: *Journal of Insect Physiology*, *Scientific Reports*
- Symposium Organizer, Pollinator Nutritional Research: From Collecting and Characterizing Floral Resource Provisions to the Inference of Ecological and Evolutionary Consequences. 2021 Entomology Society of America, Denver, CO
- 2020 USDA grant review panelist
- Grant review panelist, 2016 and 2018 OARDC SEEDS Graduate Competitions
- Symposium moderator, 2016 ESA North Central Branch Meeting, Cleveland, OH

D. Grants and contracts submitted or pending in the last year

- 2021 Maryland Department of Natural Resources. Evaluating the floral resource provisioning and ecological function of solar facility pollinator habitat plantings. \$44,467. PI: RT Richardson, CoIs: Emily Cohen and David Nelson (*Pending*)
- 2021 US Department of Defense. Broad-scale detection of floral-associated arthropods using terrestrial environmental DNA techniques. \$987,887. PI: RT Richardson, CoIs: Karen Goodell and Matthew Fitzpatrick (*Pending*)
- 2021 US Department of Agriculture. Integrating landscape ecology with molecular techniques to accelerate research on competition between honey bees and cavity nesting bees. \$299,494. PI: RT Richardson, CoIs: Amy Johnson and Rachael Bonoan (*Denied*)
- 2021 Eva Crane Trust. Characterizing the influence of land use patterns on honey bee colony productivity and dietary composition. \$40,702. PI: RT Richardson (*Denied*)

- 2020 Project *Apis m.* Evaluating long read amplicon sequencing of the complimentary sex determiner gene as an applied apicultural research tool. 41,508. PI: RT Richardson (*Denied*)
- 2020 NASA. Mobilizing community science and remote sensing to better understand pollinator health in a changing world. \$1,090,384. PI: RT Richardson, CoIs: Mary Gardiner and Andrew Elmore (*Denied*)

E. Grants and contracts received

- 2021 US Geological Survey. Metagenetic species identification and diet analysis. \$158,000. PI: RT Richardson
- 2021 Chesapeake Biological Trust. Using eDNA methods to extend biological sampling and identify candidate restorations for species reintroductions. \$193,772. PI: R Hilderbrand, CoIs: RT Richardson
- 2017 OARDC SEEDS Research Enhancement Grant. Next generation bees: Determining the floral resources that support wild bee reproduction and pollination services in urban agriculture. \$9,975. CoPIs: KJ Turo, RT Richardson
- 2016 Project *Apis m.* - Costco Honey Bee Biology Fellowship. \$150,000
- 2016 USDA SARE Grant. Next generation bees: Determining the floral resources that support wild bee reproduction and pollination services in urban agriculture. \$11,930. CoPIs: KJ Turo, RT Richardson
- 2015 North American Pollinator Protection Campaign (NAPPC) Honey Bee Health Grant. Investigating the effects of fumagillin and other common in-hive xenobiotics on immune function in honey bees. \$9,997
- 2015 OARDC SEEDS Graduate Competition. Immunotoxicological response of honey bees and bumble bees following exposure to commonly encountered xenobiotics. \$2,968
- 2014 Ohio State Beekeepers Association. Immune consequences of insecticide exposure from corn seed treatment dust in the domestic honey bee, *Apis mellifera*. \$2,523

F. Seminars and conference presentations

1. Invited seminars

- 2021 Molecular pollen analysis and its implications for pollinator nutritional research, Entomology Society of America, Denver, CO
- 2021 Genetic and genomic applications in pollinator health research. Horn Point Laboratory, Cambridge, MD
- 2021 Nature and nurture: The genetic and environmental factors influencing honey bee health and foraging, Golden Horseshoe Beekeepers Association, Hamilton, ON, Canada
- 2021 Harnessing genetics and genomics to better understand bee health, Institute of Marine and Environmental Technology, Baltimore, MD

- 2020 Genetic Applications in Pollinator Health and Beyond. University of Maryland Center for Environmental Science, Frostburg, MD
- 2017 Multi-locus metabarcoding reveals springtime foraging patterns of the honey bee, *Apis mellifera*, in central Ohio, USA. Entomological Society of America, Denver, CO
- 2016 Investigating a novel multi-locus metabarcoding classification pipeline. Plant and Pollen Metabarcoding Summerschool, University of Wurzburg, Wurzburg, Germany
- 2015 Comparing the suitability of the ITS2, *matK* and *rbcL* loci for pollen metabarcoding. Entomological Society of America, Minneapolis, MN
- 2015 Investigating the effects of fumagillin on honey bee immune function. North American Pollinator Protection Campaign, Washington, DC
- 2015 Pollen analysis: Is metabarcoding the next generation? 6th International Barcode of Life Conference, University of Guelph, Guelph, ON

2. Conference presentations

- 2020 A nationwide study reveals the influences of land use on honey bee colony productivity in Canada. Entomological Society of America, Virtual conference
- 2019 Parsing the Genetic and Environmental Determinants of Honey Bee Colony Size. Entomological Society of Ontario, Irondale, ON
- 2018 Development and validation of an arthropod metabarcoding bioinformatic workflow. Entomological Society of America, Vancouver, BC
- 2018 Understanding pollinator floral resource use using quantitative molecular methods. BeeCon2018, Toronto, ON
- 2018 Investigating honey bee pollen foraging patterns using multi-locus metabarcoding. American Bee Research Conference, Reno, NV
- 2017 Morphological and functional characterization of honey bee hemocytes. American Bee Research Conference, Galveston, TX
- 2016 Multi-locus metabarcoding reveals floral origins of honey bee pollen diet across a Midwestern urban-rural gradient. International Congress of Entomology, Orlando, FL
- 2016 Fumagillin exposure suppresses reactive oxygen species production in honey bee hemocytes. American Bee Research Conference, Jacksonville, FL
- 2014 A comparative study of ITS2 metabarcoding and traditional microscopic palynology as methods of identifying the taxonomic origins of bee collected pollen. Ohio Valley Entomological Society, Columbus, OH

3. Outreach presentations

- 2017 On-site and interactive determination of the floral origins of Ohio honey using microscopic palynology. Ohio State Beekeepers Association Fall Meeting, Plain City, OH
- 2017 The biology of honey bees and their importance to agriculture. Cleveland Botanical Gardens – Midtown Learning Farm, Cleveland, OH
- 2016 Detection and quantification of *Nosema* disease in Ohio apiculture: A hands-on workshop. Ohio State Beekeepers Association Fall Meeting, Plain City, OH
- 2016 Detecting and controlling *Nosema* disease in honey bees. Miami Valley Beekeepers Association, Troy, OH
- 2016 Ohio State University Museum of Biological Diversity Open House Volunteer, Columbus, OH
- 2016 From the dance floor to the flower patch: How honey bees economize foraging. Evolution and Ecology Club, The Ohio State University, Columbus, OH
- 2015 The riddle of *Nosema*: Is the cure worse than the disease? Ohio State Beekeepers Association Fall Meeting, Plain City, OH (*presented with Reed M. Johnson*)
- 2015 Assessing the immunological side effects of fumagillin exposure in honey bees. Miami Valley Beekeepers Association, Troy, OH and Greene County Beekeepers Association, Xenia, OH
- 2014 The bee immune system. Honey Bee Health Management Workshop: Diagnostics, Biology and Management Approaches, Wooster, OH
- 2014 qPCR: A diagnostic tool for honey bee virus detection. Honey Bee Health Management Workshop: Diagnostics, Biology and Management Approaches, Wooster, OH

A. Research awards

- 2016 German DAAD Plant & Pollen Metabarcoding Summerschool Travel Scholarship, University of Wurzburg, Wurzburg, Germany
- 2015 Ohio State University Walter C. Rothenbuhler Travel Award
- 2015 Presidents Prize in Physiology, Biochemistry and Toxicology (PBT), Entomological Society of America, Minneapolis, MN

IV. TEACHING EXPERIENCE

University of Maryland Center for Environmental Science

Guest Lecture, MEES660 Ecological Foundations (Fall 2021): Ecology and biodiversity of bees (Hymenoptera: Anthophila)

Guest Lecture, MEES680 Cell & Molecular Biology for Environmental Scientists (Spring 2021): Metagenetic analysis of pollinator foraging ecology

The Ohio State University, Center for Life Sciences Education

Human Biology (Teaching Assistant: Fall 2013, Spring 2014)

The Ohio State University, Department of Entomology

Introductory Beekeeping (Teaching Assistant: Spring 2015, Spring 2016)

General Insect Pest Management (Teaching Assistant: Fall 2014)

Insect Biology (Teaching Assistant: Fall 2015)

A Hitchhikers Guide to Molecular Techniques (Instructor: Fall 2015)