Rebecca Batstone

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IGB Postdoctoral Fellow
Institute for Genomic Biology (IGB)
Infection Genomics for One Health Theme
University of Illinois at Urbana-Champaign

Professional Appointments

McMaster University — Starting July 2022
Assistant Professor, Department of Biology

University of Illinois at Urbana-Champaign — Sept 2018–Present
Postdoctoral Fellowship, Carl R. Woese Institute for Genomic Biology

- Advisor: Dr. Katy Heath

Education

University of Toronto (UofT) — Sept 2012–Oct 2018
Doctor of Philosophy, Department of Ecology and Evolutionary Biology

- Advisor: Megan Frederickson
- Committee: John Stinchcombe, Arthur Weis

Memorial University of Newfoundland (MUN) — May 2010–Aug 2012
Master of Science, Department of Biology

- Advisor: Suzanne Dufour
- Committee: Paul Snelgrove, Duncan McIlroy

Memorial University of Newfoundland (MUN) — Sept 2006–April 2010
Bachelor of Science (Honours), Department of Biology

- Advisor: Paul Snelgrove

Scholarships and Awards

Research Scholarships

Cumulative total ~ 250K USD or 330K CAD — **2009–Present**

Carl R. Woese Institute for Genomic Biology — 2018–2021
Postdoctoral Fellowship, UIUC — *$196,500 USD total*

- Additional 7K per year for research funds
- Working closely with Dr. Katy Heath (Plant Biology Department)

Ontario Graduate Scholarships — 2015–2017
Graduate Research Award, UofT — *$45,000 CAD total*

- Awarded in recognition of academic excellence

Zimmerman-Weis Award in Ecology and Evolutionary Biology 2014–2015
Graduate Field Research Award, UofT *$4,750 CAD*
- Awarded for research conducted at the Koffler Scientific reserve

RDC Ocean Industries Student Research Awards 2011–2012
Graduate Research Award, MUN *$13,333 CAD*
- Additional 3K in research funds

Centenary of Responsible Government Scholarship 2009–2010
Undergraduate Award, MUN *$1,000 CAD*

Awards and Recognition

- **Finalist for *New Phytologist*'s Tansley Medal**: 2021
  $700 USD, outstanding contribution to plant science research
- **Jasper Loftus-Hills Young Investigator Award**: 2021
  $700 USD, outstanding promise and accomplishments
- **Teaching excellence**: 2020
  Rated by students as being a highly effective instructor for IB372
- **P. A. Abrams Award**: 2018
  $250 CAD, academic excellence
- **H. H. Harvey Prize**: 2017
  $500 CAD, academic service
- **Ramsay Wright Award**: 2016
  $500 CAD, academic excellence
- **Centre for Global Change Science Award**: 2015
  $1,831 CAD, travel for Evolution conference
- **Outstanding Teaching Award**: 2014
  Most effective lab instructor for BIO220
- **Endowment Awards**: 2013–2018
  $11,569 CAD total, various donors
- **H. H. Harvey Travel Grants**: 2013–2017
  $2000 CAD total, travel for conferences
- **SGS Conference Grant**: 2013
  $500 CAD, travel for conference in California

Publications

[13] **Batstone**, R. T., Lindgren, H., Allsup, C. M., Goralka, L. A., Riley, A. B., Grillo, M. A., Marshall-Colon, A., & Heath, K. D. (2021). The complex genetics of symbiotic extended phenotypes across environments in a model mutualism. *bioRχiv*. https://www.biorxiv.org/content/10.1101/2021.08.03.454976v1

[12] **Batstone**, R. T., Burghardt, L. T., & Heath, K. D. (2021). The genetic basis of cooperation and conflict in natural populations of a model symbiont. *bioRχiv*. https://www.biorxiv.org/content/10.1101/2021.07.19.452989v2

[11] **Batstone**, R. T. (2021). Genomes within genomes: Nested symbiosis and its implications for plant evolution [in review, finalist for the Tansley Medal]. *New Phytologist*.

[10] **Batstone**, R. T., OBrien, A. M., Harrison, T. L., & Frederickson, M. E. (2020). Experimental evolution makes microbes more cooperative with their local host genotype. *Science*, *370*(6515), 476–478.

[9] **Batstone**, R. T., Peters, M. A., Simonsen, A. K., Stinchcombe, J. R., & Frederickson, M. E. (2020). Environmental variation impacts trait expression and selection in the legume-rhizobium symbiosis. *American Journal of Botany*, *107*(2), 195–208.

[8] Baucon, A., Bednarz, M., Dufour, S., Felletti, F., Malgesini, G., Neto de Carvalho, C., Niklas, K., Wehrmann, A., **Batstone**, R. T., Bernardini, F., Et al. (2020). Ethology of the trace fossil chondrites: Form, function and environment.

[7] Zhang, X., Wang, L., Li, J., **Batstone**, R. T., & Frederickson, M. E. (2020). *Medicago truncatula* adjusts root proliferation, nodule formation, and partner choice in response to local n heterogeneity. *Plant and Soil*, *450*(1), 417–428.

[6] **Batstone**, R. T., Carscadden, K. A., Afkhami, M. E., & Frederickson, M. E. (2018). Using niche breadth theory to explain generalization in mutualisms. *Ecology*, *99*(5), 1039–1050.

[5] **Batstone**, R. T., Dutton, E. M., Wang, D., Yang, M., & Frederickson, M. E. (2017). The evolution of symbiont preference traits in the model legume *Medicago truncatula*. *New Phytologist*, *213*(4), 1850–1861.

[4] **Batstone**, R. T., & Dufour, S. C. (2016). Closely related thyasirid bivalves associate with multiple symbiont phylotypes. *Marine Ecology*, *37*(5), 988–997.

[3] Laurich, J. R., **Batstone**, R. T., & Dufour, S. C. (2015). Temporal variation in chemoautotrophic symbiont abundance in the thyasirid bivalve *Thyasira* cf. *gouldi*. *Marine biology*, *162*(10), 2017–2028.

[2] Dufour, S. C., Laurich, J. R., **Batstone**, R. T., McCuaig, B., Elliott, A., & Poduska, K. M. (2014). Magnetosome-containing bacteria living as symbionts of bivalves. *The ISME Journal*, *8*(12), 2453–2462.

[1] **Batstone**, R. T., Laurich, J. R., Salvo, F., & Dufour, S. C. (2014). Divergent chemosymbiosis-related characters in *Thyasira* cf. *gouldi* (bivalvia: Thyasiridae). *PLoS One*, *9*(3).

Selected presentations

Since 2010, I have presented at nineteen (19) international conferences, in countries including the US and Canada as well as Sweden, Brazil, Germany, and France, and have been invited to give several talks at universities across the states and Canada.

[9] **Batstone**, R. T., Burghardt, L. T., & Heath, K. D. (2021). Evolution in a symbiotic world: The genomic basis of conflict and cooperation in experimentally-evolved and natural symbiont populations, (virtual). Evolution Conference
***Invited speaker, winner of the 2021 Jasper Loftus-Hills Young Investigator Award**.

[8] **Batstone**, R. T., Burghardt, L. T., & Heath, K. D. (2021). Intergenomic conflict and cooperation in the model legume-rhizobium symbiosis, (virtual). Institute for Genomic Biology's Fellows Symposium
***Invited speaker**.

[7] **Batstone**, R. T., & Heath, K. D. (2021). Microbial evolution and its effects on One Health, (virtual). Department of Biological Sciences' Seminar Series at Binghamton University
***Invited speaker**.

[6] **Batstone**, R. T., & Heath, K. D. (2021). Evolution in a microbial world, (virtual). Organisms and Evolution Seminar Series in the Department of Biology at Duke University
***Invited speaker**.

[5] **Batstone**, R. T., & Heath, K. D. (2020). From genomes to symbiotic phenotypes: Mechanisms of adaptation through conflict and cooperation in a model mutualism, (virtual). Department of Ecology and Evolutionary Biology's Seminar Series, University of Pittsburgh
***Invited speaker**.

[4] **Batstone**, R. T., OBrien, A. M., Harrison, T. L., & Frederickson, M. E. (2020). Experimental evolution results in rapid adaptation of rhizobia to their local legume host, (Pacific Grove, California, USA). American Society of Naturalists stand-alone meeting
***One of four postdoc talks to receive an honorable mention**.

[3] **Batstone**, R. T., OBrien, A. M., Harrison, T. L., & Frederickson, M. E. (2019). Experimental evolution reveals rapid local adaptation of rhizobia to legumes, (Providence, Rhode Island, USA). Evolution Conference
***Invited speaker: finalist for the W. D. Hamilton Award ($500)**.

[2] **Batstone**, R. T., Dutton, E. M., Wang, D., Yang, M., & Frederickson, M. E. (2016). Root foraging and mutualism-stabilizing traits in *Medicago truncatula*, (St. John's, Newfoundland, Canada). Canadian Society for Ecology and Evolution
***Won 1st place for best student oral presentation ($500)**.

[1] **Batstone**, R. T., Laurich, J. R., Salvo, F., & Dufour, S. C. (2011). Understanding the ecology and evolution of thyasirids (bivalvia: Thyasiridae) from organically enriched habitats in newfoundland, (St. John's, Newfoundland, Canada). Aldrich Interdisciplinary Conference
***Won the Student Affairs and Services Award for Research in Sustainability ($600)**.

Teaching and mentorship

Cumulative teaching experience = 1,410 hrs **2010–Present**

- **Instructor** at University of Illinois, Urbana-Champaign Fall 2020
  Evolution (IB372) - one term
  - I developed this inquiry-based course involving both asynchronous and synchronous activities to guide students through the scientific process (e.g., generating and testing hypotheses using R, presenting results to the class).
  - I designed guides for reading primary research articles and research presentations that students could use as resources throughout my course.
  - I made the "Teaching excellence" list in 2020, based on being rated as a highly effective instructor by my students.
- **Laboratory instructor** at University of Toronto (UofT) 2013-2018
  Genomes to Ecosystems (BIO220) - six terms
  - I helped design and then led several long-term experiments that students were required to set up, collect data on, analyze and visualize the data, and finally, discuss their results with the class.
  - I won the "Outstanding Teaching Assistant Award" in 2014, based on being rated as a highly effective instructor by my students.
- **Laboratory instructor** at UofT 2012-2017
  Adaptation and Biodiversity (BIO120) - four terms
  - I led hands-on activities that ranged from live insect handling (the Madagascar hissing cockroaches really got the students attention!), to running gels, and building phylogenetic trees, all designed to give students experience with hypothesis generation and testing.

- I guided students through the process of writing a scientific proposal, which involved them having to submit an initial version, receive feedback, and then revise accordingly.

- **Teaching assistant** at UofT Fall 2014
  Plant-Animal Interactions (EEB440) - one term
  - I led hands-on activities including nature walks, games, and experiments, and evaluated students' research proposals.

- **Teaching assistant** at Memorial University (MUN) Summer 2012
  Benthic Biology (BIOL3712) - one term
  - I assisted the course instructor with developing and then running this two-week intensive field course located at the Bonne Bay Marine Station in Newfoundland.
  - I helped students set up short-term experiments, and evaluated their assignments.

- **Teaching assistant** at MUN Spring 2012
  Marine Biology (BIOL4810) - one term
  - For this field course at the Bonne Bay Marine stations, I helped students set up their own independent projects that involved trouble-shooting methods, analyzing data, and presenting their results to the rest of the class.

- **Teaching assistant** at MUN Winter 2011
  Biology of the Vertebrates (BIOL2210) - one term
  - I helped lead the lab-component of the course that involved students conducting activities on both preserved and live specimens from different taxanomic groups.

- **Teaching assistant** at MUN Fall 2010
  Principles of Marine Biology (BIOL3711) - one term
  - I prepared and gave three one-long lectures in partial fulfilment for the "Graduate Program in Teaching", and helped with marking student assignments and exams.

Guest lectures

- UIUC: Guest lecturer for IGB's 'Training in Team Science' course (IB299) Spring 2020
- UIUC: Panelist for the Honors course IB270 (Evolution of Cells and Molecules) Fall 2019
- UIUC: Co-led population genomics activity for IB405 (Ecological genetics) Spring 2019
- UofT: Panelist at the Careers in Research in Ecology and Evolution workshop Fall 2014
- UofT: Guest speaker for EEB488 (Research Issues in Ecology and Evolutionary Biology) Spring 2014
- UofT: Guest lecturer for EEB321 (Community Ecology) Fall 2013
- UofT: Presenter at the 'Careers in Research in Ecology and Evolution' workshop Fall 2012
- MUN: Guest lecturer for BIOL4810 (Benthic Biology) at the Bonne Bay Marine Station Spring 2010

Graduate Program in Teaching

Certification based on attending weekly seminars, and giving 3 hr-long guest lectures Fall 2010

Mentorship

I've had the privilege of directly supervising eleven (11) undergraduate students, five of whom are fellow coauthors on several of my publications (denoted with an *). My role has mostly involved guiding students through the entire scientific process (i.e., coming up with a research question, experimental design and set-up, data collection and analysis, and writing up the results). For every student below, I have also provided feedback on their written work, including both research proposals and final term papers/theses.

11. **James Kosmopoulos**, UIUC, IB390 2019–Current
    Project: Variation in partner quality of Ensifer meliloti outside of the root nodule.
    Won two undergraduate research scholarships based on his outstanding research proposal

10. **Laura Goralka**, UIUC, IB490 2018–2019
    Project: Genetic variance in antibiotic resistance in Rhizobium leguminosarum
    Received 'High Distinction' on her senior thesis
9. **Daniel Li**, UofT, EEB397 2017–2018
    Project: Determining how the environment and partner choice shapes rhizobial diversity.
8. **Judith Li**, UofT, EEB397 2016–2017
    Project: Does micro-heterogeneity in the nitrogen environment affect partner choice in the legume-rhizobium symbiosis?
    ***Publication no. 7**
7. **Xue Zhang**, UofT, EEB397 2016–2017
    Project: Effects of nitrogen heterogeneity on the legume-rhizobia mutualism.
    ***Publication no. 7**
6. **Carol Chen**, UofT, ROP299 2015–2016
    Project: The effect of genotypic variation of Medicago truncatula *on strain proportion of* Ensifer meliloti *over time.*
5. **Luxiang Wang**, UofT, CGSC summer intern 2015–2016
    Project: The effect of N heterogeneity on the legume-rhizobium mutualism.
    Won the Centre for Global Change Science research scholarship based on his outstanding proposal
    ***Publication no. 7**
4. **Aadiyat Ahmad**, UofT, EEB498 2014–2015
    Project: Mutualism stability and the evolution of sanctions of Medicago truncatula
3. **Madeline Peters**, UofT, ROP299 2014–2015
    Project: Examining the role of partner choice in natural populations of Medicago lupulina
    ***Publication no. 9**
2. **Shree Senthivasan**, UofT, EEB397 2013–2014
    Project: Making it big as a freeloader: Accounting for the persistence of ineffective rhizobial partners in the legume-rhizobia symbiosis.
1. **Molly Yang**, UofT, ROP299 2012–2013
    Project: The implications of root nitrogen foraging in Medicago truncatula *on legume-rhizobia mutualism stability.*
    ***Publication no. 5**

I additionally worked with volunteers and part-time undergraduate employees:

- **Volunteers**, UofT 2014–2017
  Recruited and managed 35 undergraduate volunteers who helped me conduct my research
- **Work-Study program**, UofT 2013–2018
  Interviewed and managed 17 paid undergraduates who helped me conduct my research
- **Women in Science and engineering Program**, MUN 2009–2010
  Mentored two high-school students who worked over the summer at the Harp Seal Research Facility

Academic Service

Conference organization and volunteering

- Panelist for the Microbial Systems Initiative Symposium Spring 2021
- Moderator for the Evolution Community Resources for Early Career Researchers (ECR^2) series Summer 2020
- UIUC: Co-organiser of the IGB's Fellow's Symposium Spring 2019

- Symposium co-organiser for the CSEE Conference in Victoria, BC, Canada — Summer 2017
- Volunteer at the Evolution Conference in Guarujá, Brazil — Summer 2015
- UofT: Co-organiser of the EEB dept's Atwood Colloquium — Spring 2015
- MUN: Volunteer at the Aldrich Interdisciplinary Conference — Spring 2011

Science Outreach

- **Genome Day**, Pygmalion festival — Fall 2021
  Presented Microbia to kids and their families
- **Genome Day**, Franklin STEAM academy, Champaign, IL — Fall 2019
  Coordinated a team of postdocs, grad students and faculty to present Microbia to families
- **Science Café**, Urbana, IL — Spring 2019
  Presented Microbia to adults participating in IGB's monthly outreach event at Café & Co.
- **World of Genomics**, Washington, DC — Spring 2019
  Debuted Microbia at IGB's annual outreach event at the National Academy of Sciences
- **Microbia, the game**, UIUC — Spring 2019
  Designed a game (Microbia) to teach participants of all ages about microbes and mobile DNA
- **Let's Talk Science**, Canada — 2010–2014
  Volunteer for Let's Talk Science Outreach Program to engage kids G2-6 in fun science activities

EEB Graduate Student Association positions (UofT)

- **Treasurer** — 2015–2017
  Applied and was awarded the head grant that funds all EGSA activities
  Completed all paperwork related to EGSA spending accounts
- **Secretary** — 2014–2015
  Recorded and distributed meeting minutes
- **Head of Fundraising** — 2013–2014
  Coordinated events throughout the year including:
  lab coat sales, charity raffle, and the Philippines Disaster Fund
- **Charity Committee** — 2012–2014
  Helped raise money for the Toronto Wildlife Centre

Manuscript Reviews

Reviewed over 20 manuscripts in 16 different journals:

- *Nature Communications, Nature Microbiology, Proc. B* — 2021
- *Plant & Soil, Acta Oecologica, AmNat* — 2020
- *New Phytologist, Evolution, Environmental Microbiology* — 2019
- *FEMS Microbiology Letters, Proc. B, Royal Society Open Science, AmNat, Oecologia, PLoS ONE* — 2018
- *Molecular Ecology, The American Naturalist (AmNat), Oecologia* — 2017
- *New Phytologist, Journal of Ecology, AJB* — 2016
- *American Journal of Botany (AJB)* — 2015