

Eric L. Miller

Assistant Professor, Haverford College

Department of Biology
Haverford College
370 Lancaster Avenue
Haverford, PA 19041

emiller3@haverford.edu

+1 (610) 896-1225

ORCID: [0000-0002-7157-6213](https://orcid.org/0000-0002-7157-6213)

<http://microbes.sites.haverford.edu>

Professional Experience

- 2018 – Present **Haverford College**, Haverford, PA
Assistant Professor, Department of Biology
- 2017 June – 2018 June **University of Cambridge**, England
Senior Research Associate, Department of Veterinary Medicine
Principle Investigator: Prof. Lucy Weinert
Genome evolution in light of the transition to pathogenicity in Streptococcus suis
- 2017 Jan – 2017 June **University of Cambridge**, England
Research Associate, Department of Veterinary Medicine
Principle Investigator: Prof. Lucy Weinert
- 2013 Aug – 2016 Oct **Leiden University**, The Netherlands
University of Manchester, England
Research Associate, Institute of Biology Leiden and Faculty of Biology, Medicine, and Health, Manchester
Principle Investigators: Prof. Daniel Rozen and Prof. Ian Roberts
Ecological implication of diversity in Streptococcus pneumoniae bacteriocins
- 2010 Aug – 2013 Aug **Max Planck Institute for Evolutionary Biology**, Germany
Post-doctoral Research Associate
Principle Investigator: Prof. Duncan Greig
Natural history, evolution, and ecology of Saccharomyces yeast

Education

- 2010 May Ph.D. in Ecology, Evolution and Animal Behavior
University of Texas at Austin, Department of Integrative Biology
Advised by Prof. Lauren Meyers
Dissertation: *Evolution of microbial populations in heterogeneous environments*
- 2003 May B.Sc. Magna Cum Laude in Microbiology
Cornell University, Ithaca, NY

Grants, Honors, and Awards

2021	Beckman Undergraduate Scholar awarded to Christina McBride; co-supervised with Prof. Lou Charkoudian
2019	Haverford College, Teaching with Technology — <i>Acquisition of a hand-held mechanical and computational device will enable students capture novel bacterial DNA sequences</i> (\$8052)
2019	Haverford College Faculty Research Grant: <i>Development of Remote Molecular Biology Laboratories for Pathogen Detection</i> (\$6000)
2019	Mellon Tri-College Seed Grant Co-author: <i>Designing a Humanities: Natural Science Cross-Disciplinary Co-Lab</i> (\$600)
2016	Responsive mode research grant, Biotechnology and Biological Sciences Research Council: <i>Understanding the emergence of antibiotic resistance in sub-MIC environments via high-throughput experimental evolution in S. pneumoniae</i> — Not funded
2010	The College of Natural Sciences Most Outstanding Teaching Assistant, University of Texas at Austin
2005	Santa Fe Institute Complex Systems Summer School Trainee, Beijing, China
2004 – 2007	Computational Phylogenetics NSF Traineeship, University of Texas at Austin

Teaching: Student Supervision

Haverford College

2022 – 2023	Senior thesis supervision for two students
2021 – 2022	
Summer	Supervised two full-time and one part-time student research assistants
2021 – 2022	Senior thesis supervisor for five students
2020 – 2021	
Summer	Supervised five full-time and two part-time student research assistants
Spring	Supervision of two independent study students
2020 – 2021	Senior thesis supervision for four students
2019 – 2020	
Summer	Co-created and organized eight virtual summer opportunities for 54 biology students, as a replacement for plans derailed by COVID-19 pandemic.
Summer	Directly supervised three of the above summer opportunities
Summer	Supervised three part-time student research assistants
Spring	Supervision of three independent students
2019 – 2020	Senior thesis supervision for three students
2018 – 2019	
Summer	Supervised six full-time student research assistants at Haverford College and one Haverford student working at University of Cambridge
Spring	Developed laboratory and grant-writing support for Malawi veterinary students with five part-time research assistants
Spring	Supervision of one independent study student
2018 – 2019	Senior thesis supervision for four students

University of Cambridge, England

2018 Led laboratory during parental leave of primary investigator; supervision of a graduate student, three post-doctoral researchers, and a laboratory technician

Leiden University, The Netherlands

2013 – 2014 Master's student supervision, Leiden University, The Netherlands

University of Texas at Austin, Austin, TX

2008 – 2010 Teaching assistant for 48 students over three years with hands-on research course on bacteriophage experimental evolution

2005 – 2010 Mentored ten undergraduate students with their independent research

Teaching: Course Design and Instruction

Haverford College

Designates new course preparation

2023 - 2024 Bio450 Advanced Topics In Biology: Evolutionary Genetics

Bio200 Evolution, Genetics, & Genomes lecture (with Prof. Jess Comstock and Prof. Foen Peng)

Bio104 Introduction to Programming in Biology (with Prof. Sara Mathieson)

Bio325 Molecular Virology

2022 – 2023 *Pre-Tenure Sabbatical Leave*

Bio404 Senior Research in Molecular Microbiology (2 students)

2021 – 2022 Bio200 Laboratory (with Dr. Shirley Lang)

Bio320 Molecular Microbiology (redesigned for post-pandemic learning; 29 students)

Bio300 Bioinformatics Superlab (with Prof. Danielle DeLeo; 13 students)

Bio404 Senior Research in Molecular Microbiology (5 students)

2020 – 2021 Bio200 Evolution, Genetics, & Genomes lecture (with Prof. Rachel Hoang; redesigned course for remote learning during COVID-19 pandemic; 110 students)

Bio200 Laboratory (with Dr. Shirley Lang)

Crafting an Inclusive Biology Curriculum — Research, Mentorship, and Communication (with Prof. Amy Cook and Prof. Karl Johnson; 31 students)

Bio280 Independent Study (2 students)

Bio300 Bioinformatics Superlab (with Prof. Sara Mathieson; 12 students)

Bio354 Molecular Virology (33 students)

Bio404 Senior Research in Molecular Microbiology (4 students)

2019 – 2020 Bio200 Evolution, Genetics, & Genomes lecture (with Prof. Rachel Hoang; 83 students)

Bio200 Laboratory (with Dr. Shirley Lang)

Chem303 Biochemistry Superlab (with Prof. Lou Charkoudian and Dr. Bashkim Konona; 19 students)

Bio320 Molecular Microbiology (22 students)

Bio380 Independent Study (2 students)

Bio404 Senior Research in Molecular Microbiology (3 students)

2018 – 2019 Bio200 Evolution, Genetics, & Genomes lecture (with Prof. Rachel Hoang; 86 students)

Bio200 Laboratory (with Prof. David Higgins, Prof. Rachel Hoang, and Dr. Shirley Lang)
Bio354 Molecular Virology (17 students)
Bio380 Independent Study (1 student)
Bio404 Senior Research in Molecular Microbiology (4 students)

University of Cambridge, England

2018 Evolutionary genetics (Undergraduate genetics core class), Department of Genetics
2017 – 2018 Bioinformatics (Designed and taught an 8-week workshop), Department of
Veterinary Medicine

Sanger Institute / Oxford University Clinical Research Unit, Ho Chi Minh City, Vietnam

2017 Bioinformatics and antibiotic resistance testing (Created, taught, and co-supervised
two-week courses)

University of Manchester, England

2015 Microbiology (Co-instructor of undergraduate laboratories)

Christian-Albrechts Universität zu Kiel, Germany

2012, 2013 Antibiotic resistance (Created and co-taught master's-level course)

Max Planck Institute for Evolutionary Biology, Germany

2012 Phylogenetics (Created and taught a multi-day computational workshop)

Public Engagement

2019 Summer Haverford Innovation Program (HIP) IdeaLab, Haverford College
Pipette Sprint Challenge: *Creative ideas to support molecular biology research in
under-resourced countries*
2017, 2018 Designed and executed public outreach activity in DNA sequencing, British Science Week,
Cambridge, England
2010 – 2012 Public outreach volunteer, Max Planck Institute, Plön Germany
2009 – 2010 Co-developer, Science Under The Stars; bi-weekly lecture series, Austin, Texas

Professional Outreach, Service, and Affiliations

Invited Presentations

2022 Plant Biology Research Group, Department of Biology, University of Pennsylvania;
*Wrangling experimental microbiomes of A. thaliana to investigate ecosystem-level
evolutionary selection*
2019 Wind River Microbiology Conference, selected for Lightning Talk; *Investigating the genetics,
ecology, and evolution of antagonistic interactions through S. pneumoniae bacteriocins*
2018 University of Cambridge Veterinary Rounds; *Genome size reduction in the pig pathogen
Streptococcus suis*
2017 The Lancefield International Symposium on Streptococci and Streptococcal Diseases;
Genomic features in Streptococcus suis associated with clinical disease isolates.
2017 Wellcome Sanger Institute, Pathogens Working Group Meeting, Cambridge, England;
Genome reduction in Streptococcus suis
2016 Computational Biology: From Microbes to Human Health, Leiden University; *Revealing the
diversity in the infraspecific warfare strategies of Streptococcus*
2012 Max Planck Society LeadNet; *Evolutionary implications of differences between domesticated and
wild yeast*

Conference Presentations

- 2022 Gordon Research Conference on Streptococcal Biology poster presentation; *Diversity, distribution, and implications of small protein interaction molecules across 22,432 Streptococcus pneumoniae genomes*
- 2019 MicroNet Research Conference at La Salle University; supervised two posters from Haverford College students

Professional Service

- 2022 Peer reviewer, *Microbial Genomics*
- 2021 Peer reviewer, *Veterinary Research*
- 2021 Swiss National Science Foundation reviewer
- 2020, 2021 National Science Foundation panelist
- 2020 Annual Biomedical Research Conference for Minority Students Poster Judge
- 2020 Peer reviewer, *Current Opinions in Microbiology*
- 2019 Poster and Presentation Judge, EPiC Evolution in Philadelphia Conference
- 2018 Poster and Presentation Judge, EPiC Evolution in Philadelphia Conference
- 2018 – 2019 Guest Co-editor, *Genes* journal: Evolutionary genetics of *Streptococcus pneumoniae*
- 2018 – Present American Society of Microbiology, Member
- 2017 Peer reviewer, *Nature Ecology and Evolution*

Invited Lectures

- 2018, 2019 Haverford College Summer Chesick Scholars Program
Quorum sensing and cell killing in S. pneumoniae
- 2016 Undergraduate course: Bacterial Infections of Man, University of Manchester
S. pneumoniae life-cycle and pathogenesis
- 2014 – 2016 Undergraduate course: Evolutionary Biology at Leiden University, The Netherlands
Population genetics
- 2010 – 2012 Research skills at Max Plank Institute for Evolutionary Biology, Germany
Workshops on Practical computational phylogenetics for researchers

Haverford College Service

- 2023 – 2024 Pre-health student advisor, Haverford College
- 2022 – 2023 *Pre-Tenure Sabbatical Leave*
- 2021 – 2022 Pre-veterinary student advisor, Haverford College
- 2020 – 2022 Faculty representative, Council on Sustainability and Social Responsibility
- 2019 – 2022 Pre-major Academic Advisor to 6-8 first and second year students each year
- 2018 – 2022 Academic advising of 7-8 biology majors each year
- 2018 – 2022 Study Abroad coordinator, Department of Biology
- 2018 – 2022 Scientific Computing coordinator, Department of Biology
- 2018 – Current Writer of student letters of recommendation (Medical School, Graduate Programs, Internships, and Scholarships)
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| 2021 – 2022 | 84 student letters |
| 2020 – 2021 | 85 student letters |
| 2019 – 2020 | 37 student letters |
| 2018 – 2019 | 17 student letters |
- 2019 – 2020 Member, Tenure Track Faculty Search Committee, Department of Biology, in Genetics research (Prof. Amy Cooke and Prof. Foen Peng hired)

Peer-Reviewed Publications

[†]Co-first authors; ^{††}Co-senior authors
Haverford College undergraduates

In Preparation

Williams C, Miller E, Meyers L, **Miller EL**. Community-level selection evolves group assemblages phenotypes inaccessible through individual-level selection in a simple agent-based model with emergent behavior. Target Journal: *Journal of Theoretical Biology*

In Review

Murray GR, Hossain ASMM, **Miller EL**, Bruchmann S, Balmer AJ, Matuszewska M, Herbert JMC, Hadjirin NF, Mugabi R, Li G, Ferrando ML, Fernades de Oliveira IM, Nguyen T, Yen PLK, Moe AZ, Wai TS, Gottschalk M, Aragon V, Valentin-Weigand P, Heegaard PMH, Vrieling M, Maw MT, Myint HT, Win YT, Hoa NT, Bentley SD, Clavijo MJ, Wells JM, Tucker AW, and Weinert LA. The emergence and diversification of a zoonotic pathogen from within the microbiota of intensively farmed pigs. *Proceedings of the National Academy of Sciences*.

Uppender I, Yoshida O, Schrecengost A, Ranson H, Rowley D, Kishore S, Cywes C, **Miller E**, and Whalen KE. A marine derived fatty acid targets the cell membrane of gram-positive bacteria. *Antimicrobial Agents and Chemotherapy*.

Published

19) McBride CM, **Miller EL**, Charkoudian LK. An updated catalogue of diverse type II polyketide synthase biosynthetic gene clusters captured from large-scale nucleotide databases. (2023) *Microbial Genomics*. DOI: 10.1099/mgen.0.000965

18) Murray GG, Balmer AJ, Herbert J, Hadjirin NF, Kemp CL, Matuszewska M, Bruchmann S, Hossain ASMM, Gottschalk M, Tucker AW, **Miller E^{††}**, Weinert LA^{††}. (2021) Mutation rate dynamics reflect ecological changes in an emerging zoonotic pathogen. *PLoS Genetics*. DOI: 10.1371/journal.pgen.1009864

17) Hadjirin N, **Miller E**, Murray GGR, Yen PLK, Phuc HD, Wileman TM, Hernandez-Garcia J, Williamson SM, Parkhill J, Maskell D, Zhou R, Fittipaldi N, Gottschalk M, Tucker DAW, Ngo TH, Welch JJ, Weinert LA. (2021) Linking phenotype, genotype and ecology: antimicrobial resistance in the zoonotic pathogen *Streptococcus suis*. *BMC Biology*. DOI: 10.1186/s12915-021-01094-1

16) Murray GG[†], Charlesworth J[†], **Miller EL**, Casey MJ, Lloyd CT, Hadjirin NF, Gottschalk M, Tucker AW, Welch JJ, Weinert LA. (2020) Genome reduction is associated with bacterial pathogenicity across different scales of temporal and ecological divergence. *Molecular Biology and Evolution*. DOI:10.1093/molbev/msaa323

15) Parry-Hanson KA, Holmes M, **Miller EL**, Grant AJ. (2018) Microbiological quality and antimicrobial resistance characterization of *Salmonella* spp. in fresh milk value chains in Ghana. *International Journal of Food Microbiology*. DOI: 10.1016/j.ijfoodmicro.2018.04.025

14) **Miller EL[†]**, Kjos M[†], Abrudan MI, Roberts IS, Veening J-W, Rozen DE. (2018) Eavesdropping and crosstalk between secreted quorum sensing peptide signals that regulate bacteriocin production in *Streptococcus pneumoniae*. *The ISME Journal*. DOI: 10.1038/s41396-018-0178-x

- 13) Rogers DW, McConnell E, **Miller EL**, Greig D. (2017) Diminishing returns on intragenic repeat number expansion in the production of signaling peptides. *Molecular Biology and Evolution*. DOI: 10.1093/molbev/msx243
- 12) **Miller EL**, Evans BA, Cornejo OE, Roberts IS, Rozen DE. (2017) Pherotype polymorphism in *Streptococcus pneumoniae* has no obvious effects on population structure and recombination. *Genome Biology and Evolution*. 9:10: 2546-2559.
- 11) Ambur OH, Engelstadter J, Johnsen PJ, **Miller EL**, Rozen DE. (2016) Steady at the wheel: conservative sex and the benefits of bacterial transformation. *Philosophical Transactions of the Royal Society B*, DOI: 10.1101/062562
- 10) **Miller EL**, Abrudan MI, Roberts IS, Rozen DE. (2016) Diverse ecological strategies are encoded by *Streptococcus pneumoniae* bacteriocin-like peptides. *Genome Biology and Evolution*, 8.4: 1072-1090.
- 9) Stelkens RB[†], **Miller EL**[†], Greig D. (2016) Asynchronous spore germination in isogenic natural isolates of *Saccharomyces paradoxus*. *FEMS Yeast Research*, 16(3):fow012.
- 8) Kjos M[†], **Miller E**[†], Slager J, Lake FB, Gericke O, Roberts IS, Rozen DE, Veening J-W. (2016) Expression of *Streptococcus pneumoniae* bacteriocins is induced by antibiotics via regulatory interplay with the competence system. *PLoS Pathogens*, 12(2):e1005422.
- 7) Abrudan, MI, Smakman F, Gimbergen AJ, Westhoff S, **Miller EL**, van Wezel GP, Rozen DE. (2015) Socially mediated induction and suppression of antibiosis during bacterial coexistence. *Proceedings of the National Academy of Sciences*, 112(35):11054-11059.
- 6) Kowallik V, **Miller EL**, Greig D. (2015) The interaction of *Saccharomyces paradoxus* with its natural competitors on oak bark. *Molecular Ecology*, 24(7):1596-1610.
- 5) **Miller EL**, Greig D. (2015) Spore germination determines yeast inbreeding according to fitness in the local environment. *American Naturalist*, 185(2): 291-301.
- 4) Stelkens RB, Brockhurst MA, Hurst GDD, **Miller EL**, Grieg D. (2014) The effect of hybrid transgression on environmental tolerance in experimental yeast crosses. *Journal of Evolutionary Biology*, 27(11):2507-2519.
- 3) Cowperthwaite MC, Economo EP, Harcombe WR, **Miller EL**, Meyers LA. (2008) The ascent of the abundant: how mutational networks constrain evolution. *PLoS Computational Biology*, 4(7):e10000110.
- 2) Novella IS, Ebendick-Corpus BE, Zárate S, **Miller EL**. (2007) Emergence of mammalian-adapted vesicular stomatitis virus from persistent infections of insect-vector cells. *Journal of Virology*, 81(12): 6664-6668.
- 1) Ruiz-Jarabo CM, **Miller E**, Gomez-Mariano G, Domingo E. (2003) Synchronous loss of quasispecies memory in parallel viral lineages: a deterministic feature of viral quasispecies. *Journal of Molecular Biology*, 333(3): 553-63.