



Molly Schumer

Associate Professor of Biology

 Curriculum Vitae available Online

Bio

BIO

Molly Schumer is an Assistant Professor in Biology. She is interested in genetics and evolutionary biology. After receiving her PhD at Princeton, she did her postdoctoral work at Columbia and was a Junior Fellow in the Harvard Society of Fellows and Hanna H. Gray Fellow at Harvard Medical School. Current research in the lab centers on understanding the genetic mechanisms of evolution, with a focus on natural populations.

ACADEMIC APPOINTMENTS

- Associate Professor, Biology
- Member, Bio-X

HONORS AND AWARDS

- Freeman Hrabowski Scholar, Howard Hughes Medical Institute (2023-present)
- Hanna H Gray Fellow, Howard Hughes Medical Institute (2017-2023)
- Early Career Excellence Award, Society for Molecular Biology and Evolution (2022)
- Searle Scholar, Searle Scholars Program (2021)
- Pew Scholar, Pew Scholars Program (2021)
- Alfred P Sloan Fellow, Sloan Foundation (2021)
- Rosalind Franklin Young Investigator Award, Genetics Society of America (2019)
- Milton Award, Harvard University (2017)
- Fellow, L'Oréal USA for Women in Science (2017)
- Theodosius Dobzhansky Prize, Society for the Study of Evolution (2017)
- Doctoral Dissertation Improvement Grant, National Science Foundation (2014-2016)

PROFESSIONAL EDUCATION

- Junior Fellow, Harvard University , Genetics (2019)
- Postdoctoral research, Columbia University , Genetics (2017)
- PhD, Princeton University , Evolutionary Biology (2016)
- BA, Reed College , Biology (2009)

LINKS

- Lab Website: <https://schumerlab.com>

Teaching

COURSES

2025-26

- Evolution: BIO 85 (Win)
- Revealing the Hidden Dimensions of Genomic Structural Variation: BIOS 424 (Win)
- Science Research through an Artistic Lens: BIOS 439 (Spr)

2023-24

- Evolution: BIO 85 (Win)
- bioBUDS: Building Up Developing Scientists: BIO 114A (Aut)
- bioBUDS: Building Up Developing Scientists: BIO 114B (Win)
- bioBUDS: Research Program: BIO 114C (Spr)

2022-23

- Bioscience Classroom Design Workshop: BIOS 245 (Win)
- Data Wrangling with Bash: BIOS 241 (Aut)
- Evolution: BIO 85 (Win)
- Genetics, Development and Evolution of Pigmentation: BIO 233 (Aut)
- bioBUDS: Building Up Developing Scientists: BIO 114A (Aut)
- bioBUDS: Building Up Developing Scientists: BIO 114C (Spr)
- bioBUDS: Research Program: BIO 114B (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

James Hemker, Austin Katzer, Laura Leventhal, Kaikuliumaikalani kaholoaa

Postdoctoral Faculty Sponsor

Paola Fascinetto Zago, Kelsie Hunnicutt

Doctoral Dissertation Advisor (AC)

Brena Cedraz, Tristram Dodge, Victoria Grant, Sophia Haase Cox, Nadia Haghani, Robert Hall, William Pangburn, Gabe Preising, Nemo Robles

Publications

PUBLICATIONS

- **Insertion of an invading retrovirus regulates a novel color trait in swordtail fish.** *bioRxiv : the preprint server for biology*
Haghani, N. B., Dodge, T. O., Baczenas, J. J., Gunn, T. R., He, Q., Pangburn, W., Sood, R., Fascinetto-Zago, P., Du, K., Kaatmann, A., Ou, Z., Dougan, S., Yang, et al
2025
- **Admixture Mapping Reveals Evidence for Multiple Mitonuclear Incompatibilities in Swordtail Fish Hybrids.** *Molecular ecology*
Robles, N. V., Moran, B. M., Rodríguez Barrera, M. J., Jofre, G. I., Gunn, T., Iverson, E. N., Beskid, S., Baczenas, J. J., Sedghifar, A., Andolfatto, P., Powell, D. L., Brandvain, Y., Havird, et al
2025: e70106
- **The molecular evolutionary basis of species formation revisited.** *Trends in genetics : TIG*
Frayner, M. E., Robles, N. V., Rodríguez-Barrera, M. J., Coughlan, J. M., Schumer, M.

2025

- **Sensitivity of genome-wide tests for mitonuclear genetic incompatibilities.** *bioRxiv : the preprint server for biology*
Kuster, S. A., Schumer, M., Havird, J. C., Sloan, D. B.
2025
- **Pervasive gene flow despite strong and varied reproductive barriers in swordtails.** *Nature ecology & evolution*
Aguillon, S. M., Haase Cox, S. K., Langdon, Q. K., Gunn, T. R., Baczenas, J. J., Banerjee, S. M., Donny, A. E., Moran, B. M., Fascinetto-Zago, P., Gutiérrez-Rodríguez, C., Ríos-Cárdenas, O., Morris, M. R., Powell, et al
2025
- **Ancient origin of an urban underground mosquito.** *bioRxiv : the preprint server for biology*
Haba, Y., Aardema, M. L., Afonso, M. O., Agramonte, N. M., Albright, J., Alho, A. M., Almeida, A. P., Alout, H., Alten, B., Altinli, M., Amara Korba, R., Andreadis, S. S., Anghel, et al
2025
- **Structural genomic variation and behavioral interactions underpin a balanced sexual mimicry polymorphism.** *Current biology : CB*
Dodge, T. O., Kim, B. Y., Baczenas, J. J., Banerjee, S. M., Gunn, T. R., Donny, A. E., Given, L. A., Rice, A. R., Haase Cox, S. K., Weinstein, M. L., Cross, R., Moran, B. M., Haber, et al
2024
- **Recurrent evolution of small body size and loss of the sword ornament in Northern swordtail fish.** *Evolution; international journal of organic evolution*
Preising, G. A., Gunn, T., Baczenas, J. J., Powell, D. L., Dodge, T. O., Sewell, S. T., Pollock, A., Machin Kairuz, J. A., Savage, M., Lu, Y., Fitschen-Brown, M., Meyer, A., Schartl, et al
2024
- **Swordtail fish hybrids reveal that genome evolution is surprisingly predictable after initial hybridization.** *PLoS biology*
Langdon, Q. K., Groh, J. S., Aguillon, S. M., Powell, D. L., Gunn, T., Payne, C., Baczenas, J. J., Donny, A., Dodge, T. O., Du, K., Schartl, M., Ríos-Cárdenas, O., Gutiérrez-Rodríguez, et al
2024; 22 (8): e3002742
- **Phylogenomic analyses of all species of swordtail fishes (genus Xiphophorus) show that hybridization preceded speciation.** *Nature communications*
Du, K., Ricci, J. M., Lu, Y., Garcia-Olazabal, M., Walter, R. B., Warren, W. C., Dodge, T. O., Schumer, M., Park, H., Meyer, A., Schartl, M.
2024; 15 (1): 6609
- **Hybridization in the Anthropocene - how pollution and climate change disrupt mate selection in freshwater fish.** *Biological reviews of the Cambridge Philosophical Society*
Ramirez-Duarte, W. F., Moran, B. M., Powell, D. L., Bank, C., Sousa, V. C., Rosenthal, G. G., Schumer, M., Rochman, C. M.
2024
- **Pervasive gene flow despite strong and varied reproductive barriers in swordtails.** *bioRxiv : the preprint server for biology*
Aguillon, S. M., Haase Cox, S. K., Langdon, Q. K., Gunn, T. R., Baczenas, J. J., Banerjee, S. M., Donny, A. E., Moran, B. M., Gutierrez-Rodriguez, C., Rios-Cardenas, O., Morris, M. R., Powell, D. L., Schumer, et al
2024
- **CRP-Tree: a phylogenetic association test for binary traits** *JOURNAL OF THE ROYAL STATISTICAL SOCIETY SERIES C-APPLIED STATISTICS*
Zhang, J., Preising, G. A., Schumer, M., Palacios, J. A.
2024; 73 (2): 340-377
- **Patterns of recombination in snakes reveal a tug-of-war between PRDM9 and promoter-like features.** *Science (New York, N.Y.)*
Hoge, C., de Manuel, M., Mahgoub, M., Okami, N., Fuller, Z., Banerjee, S., Baker, Z., McNulty, M., Andolfatto, P., Macfarlan, T. S., Schumer, M., Tzika, A. C., Przeworski, et al
2024; 383 (6685): eadj7026
- **A lethal mitonuclear incompatibility in complex I of natural hybrids.** *Nature*
Moran, B. M., Payne, C. Y., Powell, D. L., Iverson, E. N., Donny, A. E., Banerjee, S. M., Langdon, Q. K., Gunn, T. R., Rodriguez-Soto, R. A., Madero, A., Baczenas, J. J., Kleczko, K. M., Liu, et al
2024

- **The Ecology of Hybrid Incompatibilities.** *Cold Spring Harbor perspectives in biology*
Thompson, K. A., Brandvain, Y., Coughlan, J. M., Delmore, K. E., Justen, H., Linnen, C. R., Ortiz-Barrientos, D., Rushworth, C. A., Schneemann, H., Schumer, M., Stelkens, R.
2023
- **Genome evolution is surprisingly predictable after initial hybridization.** *bioRxiv : the preprint server for biology*
Langdon, Q. K., Groh, J. S., Aguillon, S. M., Powell, D. L., Gunn, T., Payne, C., Baczenas, J. J., Donny, A., Dodge, T. O., Du, K., Scharl, M., Ríos-Cárdenas, O., Gutierrez-Rodríguez, et al
2023
- **Patterns of recombination in snakes reveal a tug of war between PRDM9 and promoter-like features.** *bioRxiv : the preprint server for biology*
Hoge, C., de Manuel, M., Mahgoub, M., Okami, N., Fuller, Z., Banerjee, S., Baker, Z., McNulty, M., Andolfatto, P., Macfarlan, T. S., Schumer, M., Tzika, A. C., Przeworski, et al
2023
- **Individual variation in preference behavior in sailfin fish refines the neurotranscriptomic pathway for mate preference.** *Ecology and evolution*
Young, R. L., Price, S. M., Schumer, M., Wang, S., Cummings, M. E.
2023; 13 (7): e10323
- **Genomes of two Extinct-in-the-Wild reptiles from Christmas Island reveal distinct evolutionary histories and conservation insights.** *Molecular ecology resources*
Dodge, T. O., Farquharson, K. A., Ford, C., Cavanagh, L., Schubert, K., Schumer, M., Belov, K., Hogg, C. J.
2023
- **Complex hybridization between deeply diverged fish species in a disturbed ecosystem.** *Evolution; international journal of organic evolution*
Banerjee, S. M., Powell, D. L., Moran, B. M., Ramírez-Duarte, W. F., Langdon, Q. K., Gunn, T. R., Vazquez, G., Rochman, C., Schumer, M.
2023
- **Introgression.** *Current biology : CB*
Aguillon, S. M., Dodge, T. O., Preising, G. A., Schumer, M.
2022; 32 (16): R865-R868
- **Introgression** *CURRENT BIOLOGY*
Aguillon, S. M., Dodge, T. O., Preising, G. A., Schumer, M.
2022; 32 (16): R865-R868
- **Genomic insights into variation in thermotolerance between hybridizing swordtail fishes.** *Molecular ecology*
Payne, C., Bovio, S., Powell, D., Gunn, T., Banerjee, S., Grant, V., Rosenthal, G. G., Schumer, M.
2022
- **Imbalanced segregation of recombinant haplotypes in hybrid populations reveals inter- and intrachromosomal Dobzhansky-Muller incompatibilities.** *PLoS genetics*
Li, J., Schumer, M., Bank, C.
2022; 18 (3): e1010120
- **PRDM9 losses in vertebrates are coupled to those of paralogs ZCWPW1 and ZCWPW2.** *Proceedings of the National Academy of Sciences of the United States of America*
Cavassim, M. I., Baker, Z., Hoge, C., Schierup, M. H., Schumer, M., Przeworski, M.
2022; 119 (9)
- **Analysis of ancestry heterozygosity suggests that hybrid incompatibilities in threespine stickleback are environment dependent.** *PLoS biology*
Thompson, K. A., Peichel, C. L., Rennison, D. J., McGee, M. D., Albert, A. Y., Vines, T. H., Greenwood, A. K., Wark, A. R., Brandvain, Y., Schumer, M., Schluter, D.
1800; 20 (1): e3001469
- **Predictability and parallelism in the contemporary evolution of hybrid genomes.** *PLoS genetics*
Langdon, Q. K., Powell, D. L., Kim, B., Banerjee, S. M., Payne, C., Dodge, T. O., Moran, B., Fascinetto-Zago, P., Schumer, M.
1800; 18 (1): e1009914

- **Two new hybrid populations expand the swordtail hybridization model system.** *Evolution; international journal of organic evolution*
Powell, D. L., Moran, B., Kim, B., Banerjee, S. M., Aguillon, S. M., Fascinetto-Zago, P., Langdon, Q., Schumer, M.
2021
- **The genomic consequences of hybridization.** *eLife*
Moran, B. M., Payne, C., Langdon, Q., Powell, D. L., Brandvain, Y., Schumer, M.
2021; 10
- **The Genetic Architecture of Variation in the Sexually Selected Sword Ornament and Its Evolution in Hybrid Populations.** *Current biology : CB*
Powell, D. L., Payne, C., Banerjee, S. M., Keegan, M., Bashkirova, E., Cui, R., Andolfatto, P., Rosenthal, G. G., Schumer, M.
2021
- **Natural hybridization reveals incompatible alleles that cause melanoma in swordtail fish.** *Science (New York, N.Y.)*
Powell, D. L., García-Olazábal, M. n., Keegan, M. n., Reilly, P. n., Du, K. n., Díaz-Loyo, A. P., Banerjee, S. n., Blakkan, D. n., Reich, D. n., Andolfatto, P. n., Rosenthal, G. G., Scharl, M. n., Schumer, et al
2020; 368 (6492): 731–36
- **Versatile simulations of admixture and accurate local ancestry inference with mixnmatch and ancestryinfer.** *Molecular ecology resources*
Schumer, M. n., Powell, D. L., Corbett-Detig, R. n.
2020
- **Draft Genome Assembly and Annotation of the Gila Topminnow *Poeciliopsis occidentalis*** *FRONTIERS IN ECOLOGY AND EVOLUTION*
Mateos, M., Kang, D., Klopp, C., Parrinello, H., Garcia-Olazabal, M., Schumer, M., Jue, N. K., Guiguen, Y., Scharl, M.
2019; 7
- **Natural selection interacts with recombination to shape the evolution of hybrid genomes** *SCIENCE*
Schumer, M., Xu, C., Powell, D. L., Durvasula, A., Skov, L., Holland, C., Blazier, J. C., Sankararaman, S., Andolfatto, P., Rosenthal, G. G., Przeworski, M.
2018; 360 (6389): 656–59
- **How the manakin got its crown: A novel trait that is unlikely to cause speciation** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Rosenthal, G. G., Schumer, M., Andolfatto, P.
2018; 115 (18): E4144–E4145
- **What do we mean when we talk about hybrid speciation?** *HEREDITY*
Schumer, M., Rosenthal, G. G., Andolfatto, P.
2018; 120 (4): 379–82
- **Assortative mating and persistent reproductive isolation in hybrids** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Schumer, M., Powell, D. L., Delclos, P. J., Squire, M., Cui, R., Andolfatto, P., Rosenthal, G. G.
2017; 114 (41): 10936–41
- **Repeated losses of PRDM9-directed recombination despite the conservation of PRDM9 across vertebrates** *ELIFE*
Baker, Z., Schumer, M., Haba, Y., Bashkirova, L., Holland, C., Rosenthal, G. G., Przeworski, M.
2017; 6
- **Early social learning triggers neurogenomic expression changes in a swordtail fish** *PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES*
Cui, R., Delclos, P. J., Schumer, M., Rosenthal, G. G.
2017; 284 (1854)
- **Determining epistatic selection in admixed populations** *MOLECULAR ECOLOGY*
Schumer, M., Brandvain, Y.
2016; 25 (11): 2577–91
- **Ancient hybridization and genomic stabilization in a swordtail fish** *MOLECULAR ECOLOGY*
Schumer, M., Cui, R., Powell, D. L., Rosenthal, G. G., Andolfatto, P.

2016; 25 (11): 2661–79

- **Admix'em: a flexible framework for forward-time simulations of hybrid populations with selection and mate choice** *BIOINFORMATICS*
Cui, R., Schumer, M., Rosenthal, G. G.
2016; 32 (7): 1103–5
- **simMSG: an experimental design tool for high-throughput genotyping of hybrids** *MOLECULAR ECOLOGY RESOURCES*
Schumer, M., Cui, R., Rosenthal, G. G., Andolfatto, P.
2016; 16 (1): 183–92
- **Genetics of Intraspecies Variation in Avoidance Behavior Induced by a Thermal Stimulus in *Caenorhabditis elegans*** *GENETICS*
Ghosh, R., Bloom, J. S., Mohammadi, A., Schumer, M. E., Andolfatto, P., Ryu, W., Kruglyak, L.
2015; 200 (4): 1327–+
- **Reproductive Isolation of Hybrid Populations Driven by Genetic Incompatibilities** *PLOS GENETICS*
Schumer, M., Cui, R., Rosenthal, G. G., Andolfatto, P.
2015; 11 (3): e1005041
- **Environmental heterogeneity generates opposite gene-by-environment interactions for two fitness-related traits within a population** *EVOLUTION*
Culumber, Z. W., Schumer, M., Monks, S., Tobler, M.
2015; 69 (2): 541–50
- **High-resolution Mapping Reveals Hundreds of Genetic Incompatibilities in Hybridizing Fish Species** *ELIFE*
Schumer, M., Cui, R., Powell, D., Dresner, R., Rosenthal, G. G., Andolfatto, P.
2014; 3
- **HOW COMMON IS HOMOPLOID HYBRID SPECIATION?** *EVOLUTION*
Schumer, M., Rosenthal, G. G., Andolfatto, P.
2014; 68 (6): 1553–60
- **PHYLOGENOMICS REVEALS EXTENSIVE RETICULATE EVOLUTION IN XIPHOPHORUS FISHES** *EVOLUTION*
Cui, R., Schumer, M., Kruesi, K., Walter, R., Andolfatto, P., Rosenthal, G. G.
2013; 67 (8): 2166–79
- **Infestation by a Common Parasite is Correlated with Ant Symbiont Identity in a Plant-Ant Mutualism** *BIOTROPICA*
Schumer, M., Birger, R., Tantipathananandh, C., Aurisano, J., Maggioni, M., Mwangi, P.
2013; 45 (3): 276–79
- **Genetic accommodation and behavioural evolution: insights from genomic studies** *ANIMAL BEHAVIOUR*
Renn, S. C. P., Schumer, M. E.
2013; 85 (5): 1012–22
- **AN EVALUATION OF THE HYBRID SPECIATION HYPOTHESIS FOR XIPHOPHORUS CLEMENCIAE BASED ON WHOLE GENOME SEQUENCES** *EVOLUTION*
Schumer, M., Cui, R., Boussau, B., Walter, R., Rosenthal, G., Andolfatto, P.
2013; 67 (4): 1155–68
- **Parallel Molecular Evolution in an Herbivore Community** *SCIENCE*
Zhen, Y., Aardema, M. L., Medina, E. M., Schumer, M., Andolfatto, P.
2012; 337 (6102): 1634–37
- **Comparative gene expression profiles for highly similar aggressive phenotypes in male and female cichlid fishes (*Julidochromis*)** *JOURNAL OF EXPERIMENTAL BIOLOGY*
Schumer, M., Krishnakant, K., Renn, S. C. P.
2011; 214 (19): 3269–78
- **A serine cluster mediates BMAL1-dependent CLOCK phosphorylation and degradation** *CELL CYCLE*
Spengler, M. L., Kuropatwinski, K. K., Schumer, M., Antoch, M. P.
2009; 8 (24): 4138–46