

Brian P.H. Metzger

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EDUCATION

- 2015 Ph.D., University of Michigan, Department of Ecology and Evolutionary Biology
2009 B.S., University of Wisconsin-Madison

PROFESSIONAL APPOINTMENTS

- 2021 Staff Scientist, University of Chicago-Department of Ecology and Evolution
2020 Postdoc Researcher, University of Chicago- Department of Ecology and Evolution
2016 Postdoc Fellow, University of Chicago- Department of Ecology and Evolution

RESEARCH

My research studies the evolution and genetic basis of regulatory differences between distantly related species. I use genomic approaches to systemically determine the number, identity, and effects of genetic differences between species. I replicate these historical changes within the laboratory using experimental evolution to generate a broader understanding of the genetic mechanisms underlying the emergence and evolution of these ancient regulatory changes.

PUBLICATIONS

Refereed Journal Articles

Equal Contributions

12. Duveau, F., Vande Zande, P., **Metzger, B.P.H.**, Diaz, C.J., Walker, E.A., Tryban, S., Siddiq, M.A., Yang, B., Wittkopp, P.J. (2021) Mutational sources of *trans*-regulatory variation affecting gene expression in *Saccharomyces cerevisiae*. *eLife* 10:e67806.
11. Xie V.C., Pu J., **Metzger B.P.H.**, Thornton J.W., Dickinson B.C. (2021) Contingency and chance erase necessity in the experimental evolution of ancestral proteins. *eLife* 10:e67336
10. Hochberg, G.K.A., Liu, Y., Marklund, E., **Metzger, B.P.H.**, Laganowsky, A., Thornton, J.W. (2020) A hydrophobic ratchet entrenches molecular complexes. *Nature* 588, 503–508.

9. **Metzger, B. P. H.**, & Wittkopp, P. J. (2019) Compensatory *trans*-regulatory alleles minimizing variation in *TDH3* expression are common within *Saccharomyces cerevisiae*. *Evolution Letters*. 3-5:448-461
8. Duveau, F., Hodgins-Davis, A., **Metzger, B.P.H.**, Yang, B., Tryban, S., Walker, E., Lybrook, P., and Wittkopp, P.J. (2018) Fitness effects of altering gene expression noise in *Saccharomyces cerevisiae*. *eLife*. 7:e37272.
7. Duveau, F., Yuan, D.C., Metzger, B.P.H., Hodgins-Davis, A., and Wittkopp, P.J. (2018) Effects of mutations and selection on plasticity of *TDH3* promoter activity in *Saccharomyces cerevisiae*. *Proceedings of the National Academy of Sciences*. 114(52):E11218-E11227.
6. Maclean, C.J., Metzger, B.P.H., Yang J.-R., Ho, W.-C., Moyers, B., and Zhang, J. (2017) Deciphering the genic basis of environmental adaptations by simultaneous forward and reverse genetics in *Saccharomyces cerevisiae*. *Molecular Biology and Evolution*. 34(10):2486-2502.
5. **Metzger, B.P.H.**, Wittkopp, P.J., and Coolon, J.D. (2017) Evolutionary dynamics of regulatory changes underlying gene expression divergence among *Saccharomyces* species. *Genome Biology and Evolution*. 9(4):843–854.
4. Metzger, B.P.H., Duveau, F., Yuan, D.C., Tryban, S., Yang, B., and Wittkopp, P.J. (2016) Contrasting frequencies and effects of *cis*- and *trans*-regulatory mutations affecting gene expression. *Molecular Biology and Evolution*. 33(5):1131-1146.
3. **Metzger, B.P.H.**, Yuan, D.C., Gruber, J.D., Duveau, F., and Wittkopp, P.J. (2015) Selection on noise constrains a eukaryotic promoter. *Nature*. 521:344-347.
2. Duveau, F., **Metzger, B.P.H.**, Gruber, J.D., Mack, K., Sood, N., Brooks, T., and Wittkopp, P.J. (2014) Mapping small effect mutations in *Saccharomyces cerevisiae*: impacts of experimental design and mutational properties. *G3*. 4:1205-1216.
1. **Metzger, B.P.H.**, Gelembiuk, G.W., and Lee, C.E. (2013) Direct sequencing of haplotypes from diploid individuals through a modified emulsion PCR-based single-molecule sequencing approach. *Molecular Ecology Resources*. 13, 135–143.

Manuscripts in Preparation

Metzger, B.P.H., Starr, T.N., Thornton, J.W. Quantitative characterization of epistasis and evolvability in an ancestral transcription factor. In prep.

Park, Y., **Metzger, B.P.H.**, Thornton, J.W. Historical memory, epistasis, and contingency in long-term protein evolution. In prep.

Gelembiuk, G.W., **Metzger, B.P.H.**, Silva, J.C., Lee, C.E. Shifts in copepod microbiome composition across replicated saline to freshwater invasions. In revision.

GRANTS, AWARDS, AND FUNDING

- 2017 NIH F32 National Research Service Award. University of Chicago; Chicago, IL.
- 2016 Chicago Biomedical Consortium Postdoc Award. University of Chicago; Chicago, IL.
- 2015 Distinguished Dissertation Award. University of Michigan; Ann Arbor, MI.
- 2015 Best Student Paper-Ecology and Evolutionary Biology; Ann Arbor, MI.
- 2014 Block Grant-Ecology and Evolutionary Biology. University of Michigan; Ann Arbor, MI.
- 2013 Walter M. Fitch Award Finalist. Society for Molecular Biology and Evolution; Chicago, IL.
- 2013 Block Grant-Ecology and Evolutionary Biology. University of Michigan; Ann Arbor, MI.
- 2012 Block Grant-Ecology and Evolutionary Biology. University of Michigan; Ann Arbor, MI.
- 2011 Block Grant-Ecology and Evolutionary Biology. University of Michigan; Ann Arbor, MI.
- 2011 Rackham Graduate Student Research Grant. University of Michigan; Ann Arbor, MI.
- 2009 NIH Genome Sciences Training Program. University of Michigan; Ann Arbor, MI.
- 2009 Rackham Merit Fellowship. University of Michigan; Ann Arbor, MI.
- 2009 Ronald W. Hinsdill High Achievement Award. University of Wisconsin; Madison, WI.
- 2008 William B. Sarles Scholarship. University of Wisconsin; Madison, WI.
- 2008 Jack L. Pate Undergraduate Travel Award. University of Wisconsin; Madison, WI.
- 2008 Undergraduate Diversity Program. Society for the Study of Evolution; Minneapolis, MN.
- 2007 Senior Honor Thesis Research Stipend. University of Wisconsin; Madison, WI.
- 2007 Dr. and Mrs. Carl A. Bunde Fund. University of Wisconsin; Madison, WI.
- 2007 Diversity Mentoring Program. Society for Molecular Biology and Evolution; Halifax, NS.
- 2006 Hilldale Undergraduate Research Fellowship. University of Wisconsin; Madison, WI.
- 2006 Undergraduate Research Stipend. University of Wisconsin; Madison, WI.

INVITED TALKS

- 2018 JF Crow Early Career Scientist Seminar; Madison, WI.
- 2015 Princeton University; Princeton, NJ.
- 2015 Lehigh University; Bethlehem, PA.

CONFERENCE ACTIVITY

Oral Presentations

- 2021 Midwest Population Genetics; Madison, WI.
- 2021 EMBL Workshop: Predicting Evolution; Virtual conference.
- 2020 Society for Molecular Biology and Evolution. Canceled.
- 2015 Society for Molecular Biology and Evolution; Vienna, Austria.
- 2015 Mutation, Repair, and Evolution; Bloomington, IN.
- 2014 Midwest Ecology and Evolution Conference; Dayton, OH.
- 2013 Society for Molecular Biology and Evolution Fitch Symposium; Chicago, IL.

Poster Presentations

- 2019 Midwest Population Genetics; Chicago, IL.
- 2019 Molecular Mechanisms in Evolution (GRC); Easton, MA.
- 2018 Midwest Population Genetics; St. Paul, MN.

- 2018 Population, Evolutionary, and Quantitative Genetics; Madison, WI.
- 2017 Society for Molecular Biology and Evolution; Austin, TX.
- 2014 EMBO Experimental Approaches to Evolution and Ecology; Heidelberg, Germany.
- 2014 Society for Molecular Biology and Evolution; San Juan, Puerto Rico.
- 2012 Society for Molecular Biology and Evolution; Dublin, Ireland.
- 2012 IGERT: The Future of Evo-Devo - Genomes in Context; Portland, OR.
- 2010 Society for the Study of Evolution; Portland, OR.
- 2009 Society for Molecular Biology and Evolution; Iowa City, IA.
- 2008 Society for the Study of Evolution; Minneapolis, MN.
- 2008 Society for Molecular Biology and Evolution; Barcelona, Spain.
- 2007 Society for Molecular Biology and Evolution; Halifax, Nova Scotia.

CAMPUS TALKS

- 2016 Biological Sciences Division Post-Doctoral Group; Chicago, IL.
- 2015 Interdisciplinary Group Seminar; Ann Arbor, MI.
- 2015 University of Michigan Ecology and Evolutionary Biology Recruitment; Ann Arbor, MI.
- 2013 Ecology and Evolutionary Biology Lunch Seminar; Ann Arbor, MI.
- 2010 Genome Sciences Training Program Fall Orientation; Ann Arbor, MI.

TEACHING EXPERIENCE

University of Michigan

Genetics Teaching Assistant. (Winter 2010, Winter 2012)

Arizona State University

Mathematical and Theoretical Biology Institute Guest Lecturer (Summer 2010)

University of Wisconsin-Madison

Microbiology and Molecular Biology Skills Workshop Teaching Assistant (Summer 2008)

DEPARTMENTAL SERVICE AND OUTREACH

- 2019 Chicago Field Museum exhibit scientific reviewer
- 2019 Shoemith Elementary School science fair judge
- 2017 University of Chicago Post-Doc Welcome Committee Member
- 2015 Webster Elementary School science fair judge
- 2014 Univ. of Michigan. Department Admissions Committee Student Representative
- 2013 Huron High School presentations on science as a career
- 2013 Univ. of Michigan. Department Executive Committee Student Representative

PROFESSIONAL SOCIETIES

Genetics Society of America
Society for Molecular Biology and Evolution

MANUSCRIPT REVIEW

eLife
Genome Biology and Evolution
G3: Genes, Genomes, Genetics
Molecular Biology and Evolution
Nature Communications
Nature Ecology and Evolution
PLoS Genetics