

John F. Wolters
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Education

Binghamton University Binghamton, NY
PhD, Biological Sciences May 2018
Dissertation: Functional Variation in the Mitochondrial Genome of the Yeast *Saccharomyces cerevisiae*
Advisor: Heather L. Fiumera, Associate Professor of Biological Sciences
BS, Biological sciences May 2012

Appointments

Postdoctoral Researcher, Great Lakes Bioenergy Research Center, UW-Madison July 2018-Present
Teaching/Research Assistant, Binghamton University September 2012 – May 2018

Dissertation Research

My PhD research was focused on assessing the genetic basis of phenotypic variance in complex traits due to mitochondrial genome polymorphisms utilizing a combination of genetics, high-throughput sequencing, and bioinformatics techniques in the model *Saccharomyces cerevisiae*. I developed improved methodologies for purifying mitochondrial DNA samples. To learn more about genome diversity I sequenced the complex and AT-rich yeast mitochondrial genome using single-molecule sequencing platforms. I assessed the diversity of the mitochondrial genome within the species to reveal extensive structural variation, population structure, and evidence of recombination. I have developed strategies for mapping a strong temperature resistance phenotype utilizing the recombination of mitochondrial genomes that occurs in *S. cerevisiae*. The frequency of recombination and improved methods of detecting recombination from high-throughput sequencing data are currently being assessed with collaborators in Computer Science. I have established that mitochondrial DNA recombination can generate novel phenotypes intermediate between parental haplotypes and I have shown, with the aid of NSF funding, that interactions between mitochondrial alleles can impact yeast fitness in crosses between divergent populations.

Postdoctoral Research

Mitochondrial DNA (mtDNA) variation has functional effects in diverse conditions even in organisms for which respiration is not mandatory. These consequences range from impacts on unicellular growth, organismal phenotypes such as longevity, and complex diseases including cancer. The mechanisms underlying this functional variation and the evolutionary patterns shaping mtDNA variation broadly are poorly understood. Studying functional mitochondrial evolution requires diverse models which are amenable for laboratory manipulation. We suggest that the budding yeast subphylum *Saccharomycotina* provides an ideal group. Studying mitochondrial evolution in budding yeasts benefits from combining the powerful mitochondrial genetics tools developed in *Saccharomyces cerevisiae* with the evolutionary genomics approaches made possible by comparing species spanning over 400 million years of evolution. Yeast mtDNAs deviate from animal mtDNA in several ways including larger genomes, introns, and recombination between divergent haplotypes. Lack of mtDNA resources for the vast majority of these species has hindered comparative study. To functionally test the significance of mtDNA variants we are developing novel methods to transform *S. cerevisiae* with synthetic mtDNAs. The flexibility offered by synthetic mtDNA will ease the verification of functional variants, allow elimination of confounding factors such as introns that cause cytonuclear incompatibilities, and allow us to test novel hypotheses regarding the impacts of genome architecture on mitochondrial function.

Grants and Awards

National Science Foundation Doctoral Dissertation Improvement Grant June 2016-June 2018
Dissertation Research: Mitochondrial Epistasis in Yeast, Award #1601580, \$20,150

Binghamton University Graduate Award for Excellence in Research March, 2018

Dr. Norman Lazaroff Memorial Endowment for Graduate Studies, \$1,300 July, 2015

Society for the Study of Evolution Travel Award, \$500 July, 2016

Publications

J. F. Wolters, K. Chiu, and H. L. Fiumera. 2015. Population structure of mitochondrial genomes in *Saccharomyces cerevisiae*. BMC Genomics 16:451. BMC Genomics.

Mitochondrial Recombination Reveals Mito-Mito Epistasis in Yeast

John F. Wolters, Guillaume Charron, Alec Gaspary, Christian R. Landry, Anthony C. Fiumera and Heather L. Fiumera. GENETICS. May 1, 2018. vol. 209 no. 1 307-319; <https://doi.org/10.1534/genetics.117.300660>

Conference Presentations and University Seminars

Evolution Seminar Series, UW-Madison October 2018
Talk, "Functional Variation in the Mitochondrial Genome of the Yeast *Saccharomyces cerevisiae*"
GRC Ecological and Evolutionary Genomics Biddeford, Maine, July 2017
Poster, John F. Wolters, Guillaume Charron, Christian R. Landry, and Heather L. Fiumera
"Variation in mtDNA alters fitness under stress conditions due to additive and epistatic effects of mitochondrial loci"

Evolution Austin, Texas, July 2017
Poster, John F. Wolters and Heather L. Fiumera, "Mitochondrial DNA Impacts Fitness at Elevated Temperature in *Saccharomyces cerevisiae*"

GRC Ecological and Evolutionary Genomics Biddeford, Maine, July 2016
Poster, John F. Wolters, Kenneth Chiu, and Heather L. Fiumera, "New Insights into Yeast Mitochondrial Genomes Reveal Genetic and Phenotypic Variation"

Binghamton University Biological Sciences Departmental Symposium Annually, January 2015-2017
Organizer and Presenter, aided in reviving annual symposium
Excellent Presentation Award for "Recent Developments in High-Throughput Sequencing" January 2015

Presentation: Survey of High-throughput Sequencing Platforms
Biology Departmental Seminar November 2012
Genetics Class Guest Lecture November 2013
Genomics and Proteomics Guest Lecture September 2013

Binghamton University Research Days Poster Sessions Annually, 2013-2017

Teaching Positions

Genetics Laboratory, Teaching Assistant, lab sections Spring 2013, Spring 2016, AY2017-2018

Mechanisms of Evolution, discussion sections Fall 2015

Biostatistics with R, Teaching Assistant, lab sections Spring 2014

Introductory Cell and Molecular Biology, lab sections Fall 2012, Fall 2013

Professional Society Membership

Society for the Study of Evolution Ongoing since April 2017
Genetics Society of America February 2018

Professional Service

New Graduate Student Ambassador August 2017
Biology Graduate Student Organization (BGSO) Senator 2016-2017
BGSO President 2015-2016
BGSO Treasurer 2014-2015
Binghamton University Graduate Student Organization Budget Committee 2015-2017

Outreach

Wisconsin Science Festival October 2018
Activity: "Fermentation in a Bag"
Second Grader Classes Visiting the Lab April 2017
Binghamton "University Days" at the Oakdale Mall Annually, 2014-2017
Activity: Extracting DNA from Strawberries
Cornell Cooperative Extension at the Roberson Museum 2013
Activity: Extracting DNA from Strawberries