Philip John Freda, Jr.

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Education

Ph.D. Candidate, Entomology, Kansas State University. Aug, 2014 – present (G.P.A. 4.0/4.0)

- *Thesis*: Identifying mechanisms of cold hardiness across metamorphosis in *Drosophila melanogaster* (in preparation)
- *Advisors*: Gregory Ragland, Ph.D., Theodore Morgan, Ph.D.

M.S., Biology, Saint Joseph's University. 2014 (G.P.A. 4.0/4.0)

- *Thesis*: Temporal variation in microsatellite loci in wild-caught *Drosophila simulans*
- *Advisor*: John Braverman, S.J., Ph.D.

B.S., Administration of Justice, Pennsylvania State University, Abington. 2005

Research Interests

- The evolution of complex life cycles.
- Levels of genetic constraint for fitness-related traits across development.
- NGS analysis, pipelines and platforms.
- Thermal biology of arthropods.
- Invasive species biology.

Research Experience

Kansas State University, Manhattan, KS
Ph.D. Candidate, 2014 - present
Constraint across development
Discovered evidence suggesting no developmental constraint on thermal hardiness and thermal hardiness plasticity across the metamorphic boundary in *Drosophila melanogaster*. This conclusion is supported by two main points. The first is a statistically zero phenotypic and genetic correlations between larval and adult cold and heat shock survival (and their respective plasticities) and the second is a complete quantitative genetic decoupling of cold hardiness as individual genes with clear effects on cold hardiness in one life stage have no detectable, pleiotropic effect on another stage.

Thermal hardiness and niche adaptation of life-history phases
Illustrated that no phenotypic or genetic correlations exists between heat hardiness and cold hardiness in larvae and adults, providing evidence for distinct genetic architectures existing for both stress responses in either life stages. Furthermore, *D. melanogaster* larvae are more heat hardy than adults while adults are more cold hardy than larvae. The ecological differences of each stage may explain this as adults overwinter and larvae deal with extreme high temperatures in rotten fruits. Stage-specific GxE and a lack of correlation in larval and adult plasticity together provide evidence that larvae and adults have the potential to adapt to certain thermal extremes and interact with their environments in unique ways.

Ovarian development and reproductive arrest in invasive Drosophila suzukii
Uncovered evidence that, at least in the midwest, *D. suzukii* ovarian development responds to both low temperature and short photoperiod, indicated that some form of reproductive development exists in the species. Additionally, this research provides evidence that *D. suzukii* males and females have large capacity for short-term acclimation through Rapid Cold Hardening (RCH).

Saint Joseph's University, Philadelphia, PA
Post-baccalaureate and M.S. Student, 2010 – 2014
Temporal genetic variation in a natural system
Detected signs of population shifts from season to season and year to year from genomic data in a wild population of *Drosophila simulans*. Significant deviations from Hardy-Weinberg Equilibrium, coupled with low levels of heterozygosity and the beginning or ending of a year corroborate this idea as does drastically different allelic distributions during these times. Taken together, these results indicate a population bottleneck and reductions in population size and genetic variation at the end of a collection season followed by a rebound of the population, genetically distinct at several loci, the following year.

Flowering Time QTL in increasing levels of CO_2
Identified unique QTL associated with flowering time variation in recombinant inbred lines of *Arabidopsis thaliana* under both ambient and elevated (projected by IPCC) [CO_2]. Different genes appear to control flowering time pathways depending on the [CO_2] experienced by *A. thaliana*. This is an important consideration due to rising global [CO_2].

Grants and Fellowships

- Roger C. Smith Ph.D. Award in Entomology ($1,000), 2017
- Kansas State University, Department of Entomology Travel Award ($500), 2017
- Timothy R. Donoghue Graduate Scholarship ($5,000), 2014 – 2017
- Don C. Warren Genetic Scholarship ($5,000), 2016 – 2017
- Kansas State University, Department of Entomology Travel Award ($500), 2016
- Reginald H. Paint Memorial Scholarship ($1,000), 2015
- Sigma Xi Grants-in-aid-of-research (GIAR), Kansas State University Chapter ($1,000), 2015
- American Genetics Association – Ecological Genomics Travel Fellowship, 2014 ($400)
- HHMI Graduate Assistantship, 2012 – 2014
- NSF GK-12 Fellowship, 2012 – 2014

Awards/Certificates

- Certification: RNA sequencing and gene expression analysis, Kansas State University, 2015
- Certification: Quantitative real-time PCR protocol and diagnosis, Kansas State University, 2015
- Award: Saint Joseph's University – Biology Graduate Award, May 2014

Publications

Everman, E.R, **Freda, P.J.**, Brown, M., Schieferecke, A.J., Ragland, G.J., and Morgan, T.J. 2018. Ovary development and cold tolerance of the invasive pest *Drosophila suzukii* (Matsumura) in the central plains. *Environmental Entomology*. In press.

Freda, P.J., Alex, J.T., Morgan, T.J., and Ragland, G.J. 2017. Genetic decoupling of thermal tolerance across metamorphosis in *Drosophila melanogaster*. *Integrative and Comparative Biology*, *57*(5), 999-1009.

Leung, W., Shaffer, C.D., Reed, L.K., […], **Freda, P.J.,** […], and Elgin, S.C.R. 2015. *Drosophila* Muller F elements maintain a distinct set of genomic properties over 40 million years of evolution. *G3: Genes|Genomes|Genetics*, *5*(5), 719-740.

Freda, P.J. and Braverman, J.M. 2013. *Drosophila suzukii*, or Spotted Wing Drosophila, Recorded in Southeastern Pennsylvania, U.S.A. *Entomological News*, *123*(1), 71-75.

Freda, P.J. and Braverman, J.M. 2013. An efficient, practical, and reliable *Drosophila* trap. *Drosophila Information Service*, *96*, 199-201.

Presentations

Oral

Freda, P.J., Morgan, T.J., and Ragland, G.J. 2017. Identifying mechanisms of cold hardiness across metamorphosis in *Drosophila melanogaster*. 7th International Symposium of the Environmental Physiology of Ectotherms and Plants (ISEPEP7), Tartu, Estonia, August 1st, 2017.

Freda, P.J., Morgan, T.J., and Ragland, G.J. 2017. Identifying mechanisms of cold hardiness across metamorphosis in *Drosophila melanogaster*. Ecological Genomics Summer Research Forum, Manhattan, KS, June 19th, 2017.

Freda, P.J., Morgan, T.J., and Ragland, G.J. 2016. Decoupling of physiology across metamorphosis. Kansas State University, Department of Entomology 3-minute thesis competition, April 6th, 2016.

Freda, P.J., Morgan, T.J., and Ragland, G.J. 2016. Decoupling of physiology across metamorphosis. Society for Integrative and Comparative Biology (SICB) Conference, Portland, Oregon, January 4th, 2016.

Freda, P.J., Morgan, T.J., and Ragland, G.J. 2015. Ontogenetic constraint in the thermal physiology of Drosophila melanogaster: A genomic assessment of the adaptive decoupling hypothesis. Ecological Genomics Summer Research Forum, Manhattan, KS, June 23rd, 2015.

Freda, P.J., Morgan, T.J., and Ragland, G.J. 2015. Decoupling of physiology across metamorphosis. Kansas State University, Department of Entomology seminar series, November 30th, 2015.

Freda, P. and Braverman, J. 2014. Temporal Variation at Microsatellite Loci in Wild-Caught *Drosophila simulans*. Thesis defense presentation. Saint Joseph's University, Department of Biology seminar series, Philadelphia, PA, August 18th, 2014.

Posters

Brown, M., **Freda, P.J.**, Everman, E.R., Morgan, T.J., and Ragland, G.J. 2016. Phenotypic plasticity promotes persistence of an invasive pest following environmental stress. Poster presented at undergraduate research forum by Brown, M. Manhattan, KS, April 21, 2016.

Freda, P.J., Morgan, T.J., and Ragland, G.J. 2015. Evolution of complex life cycles: Is performance constrained across metamorphosis. 13th Annual Ecological Genomics Symposium. Poster Presentation, Manhattan, KS. November 6-8, 2015.

Freda, P., DiMeglio, M., and Braverman, J. 2015. Temporal Variation at Microsatellite Loci in Wild-Caught *Drosophila simulans*. Poster Presentation, Arthropod Genomics Research Symposium, Kansas State University, June 18th, 2015.

Freda, P., DiMeglio, M., and Braverman, J.M. (2014). Temporal Variation at Microsatellite Loci in Wild-Caught *Drosophila simulans*. Poster presented at the 12th Annual Ecological Genomics Symposium, Kansas City, MO, October 31 - November 2, 2014.

Freda, P. and Braverman, J. 2014. Temporal Variation at Microsatellite Loci in Wild-Caught *Drosophila simulans*. Sigma Xi Research Symposium Poster, Saint Joseph's University, April 12th, 2014.

Meghan M. M., London, S. C., Angelucci, V. C., Burke, S. M., Del Buono, M., Dell'Arciprete, A. M., Eastman, J. M., **Freda, P. J.**, *et al.* Estimating Phage Genome Sizes by Pulsed-Field Gel Electrophoresis for Preliminary Cluster Identification. Poster presentation. Fifth Annual SEA-PHAGES Symposium. Janelia Farm Research Campus, Ashburn, VA. June 7-9, 2013.

Castro, R., DiMeglio, M., **Freda, P.J.,** and Braverman, J.M. 2013. *Drosophila* Biodiversity on the Campus of Saint Joseph's University. Sigma Xi Research Symposium Poster, Saint Joseph's University, April 19th, 2013.

Healy, B.E., Springer, C.J., **Freda, P.J.,** and Braverman, J.M. 2012. Genomic regions responsible for altered reproductive characteristics of *Arabidopsis thaliana* grown at elevated [CO_2]. ASPB Plant Biology Meeting, Austin, Texas, July 20th – 24th, 2012.

Freda, P.J. and Braverman, J.M. 2012. *Drosophila* Biodiversity on the Campus of Saint Joseph's University. Sigma Xi Research Symposium Poster, Saint Joseph's University, April 13th, 2012.

Freda, P.J., Springer, C. and Braverman, J.M. 2011. Computational Study of Flowering Time Genetics with QTL Cartographer. Sigma Xi Research Symposium Poster, Saint Joseph's University, April 8th, 2011.

Research Techniques

Molecular: PCR ❖ qPCR ❖ Gel electrophoresis ❖ Primer design ❖ DNA extraction ❖ DNA quantification ❖ DNA purification ❖ Pulsed-field gel electrophoresis ❖ Restriction digest ❖ RNAi ❖ RNA extraction and purification ❖ cDNA library preparation

Bioinformatics and computational: NGS pipelines ❖ RNAseq model creation ❖ GWAS ❖ R scripting ❖ Unix/Linux scripting ❖ Sequence alignment ❖ Sequence assembly ❖ Gene annotation ❖ NCBI: BLAST ❖ QTL mapping ❖ phylogenetics

Ecological and Organismic: Organism collection and trapping (*Drosophila*) ❖ *Drosophila* rearing and maintenance ❖ *Drosophila* cold and heat shock ❖ *Drosophila* larvae manipulation

Teaching Experience

Teaching Assistant and Lecturer: Kansas State University, Manhattan, KS, 2016-2017
Course: Entom 301B – Insects and People

- ❖ Creation and instruction of lectures focusing on the relationships between insects and humans.
- ❖ Lectured on insect biology, evolution, taxonomy, behavior, and ecology.
- ❖ Grading of exams, essays, and quizzes

GK-12 Teaching Fellow: Wagner Free Institute of Science, Philadelphia, PA, 2012-2014

- ❖ Instruction of hands-on science lessons in Philadelphia school district elementary classrooms and on educational field trips.
- ❖ Collaboration with classroom teachers, full-time museum staff, and other graduate fellows to facilitate activities, field trips, and learning.

Laboratory Research Assistant: Department of Biology, Saint Joseph's University, 2012-Present

- ❖ Instruction of laboratory protocols and procedures to undergraduate researchers.
- ❖ Preparation and instruction of laboratory discussions and workshops.
- ❖ Drafting of laboratory protocols and notebooks.

Intern: Noyce Scholarship Program, Philadelphia School District's Summer Bridge Program, summer 2010.

- ❖ Designed and taught lectures on evolution, general biology, physics, ecology, and astronomy.
- ❖ Collaborated with teachers and fellow interns on pedagogical approaches and lesson plans.
- ❖ Instilled appreciation of the sciences and of nature in students entering high school.

Teaching Assistant: Department of Biology, Saint Joseph's University, 2010
Course: Bio 1011 – Cellular Biology

- ❖ Assisted in laboratory maintenance, preparation, and grading
- ❖ Aided students in understanding the general concepts and goals of the curriculum.

Mentoring

Undergraduates (9 total, 5 women, 4 minorities)
2014-2017 - Colin Bailey, Saadia Cleve, Ashley Helget-Wedin, Oshadhi Athukorala Arachchige, Mariah Brown, Nicholas Heter, Jackson Alex, Adam Schieferecke, Zainab Ali.

Professional Memberships

- ❖ Golden Key Honour Society, member, 2016 – present
- ❖ Alpha Epsilon Lambda: Graduate Students Honor Society: lifetime member, 2014 – present
- ❖ Sigma Xi: The Scientific Research Society: associate member, 2013 – present

Extracurricular Activities & Professional Service

- ❖ Committee Member, Public Relations, Popenoe Entomology Club, Kansas State University 2017 – 2018

- Member-at-Large, Committee on Governmental Issues, Kansas State University, 2016 – 2017
- Committee member, Lethal Weapons Event Sub-Committee, Kansas State University, 2016
- Team manager/player, intermural softball, Kansas State University, 2014 – present
- Recognized reviewer, Elsevier, 2014-present
- Reviewer, *Biological Control*, 2014
- Reviewer, *Journal of Pest Science*, 2014
- Member, Commencement Speaker Committee, Saint Joseph's University, 2014
- Participant, Northeast Spotted Wing Drosophila Working Group Meeting, 2013
- Recruitment Representative, Saint Joseph's University's Graduate Arts and Sciences Program, Loyola University, Maryland - Biology Career Workshop and Fair, 2013
- *Columnist, "*Practical Science with Phil Freda" - Patch.com, Upper Moreland-Willow Grove Patch, 2010-2012: http://philipfreda.com/articles/
    - *Articles available upon request*

References available upon request