

## **Philip John Freda, Jr., Ph.D.**

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### **Research Experience**

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**Cedars-Sinai Medical Center, Los Angeles, CA**

**Postdoctoral Scientist, 2022-Present**

*Machine Learning and Artificial Intelligence Pipelines for Assessing Quantitative Traits*

QTL and eQTL analysis using genetic programming and evolutionary algorithms

**University of Pennsylvania, Philadelphia, PA**

**Postdoctoral Researcher, 2019-2022**

*Opioid Dependence/Misuse Risk Assessment*

Opioid use disorder (OUD) risk assessment from electronic health records using machine learning and natural language processing

**Kansas State University, Manhattan, KS**

**Ph.D. Candidate, 2014 - 2018**

*Constraint across Development*

Measurement of genetic, phenotypic, and gene expression constraint across the major life cycle transition in the model species, *Drosophila melanogaster*

**Saint Joseph's University, Philadelphia, PA**

**Post-baccalaureate and M.S. Student, 2010 – 2014**

*Temporal Genetic Variation in a Natural System*

Assessment of population shifts from over time from genomic data in a wild population of *Drosophila simulans*.

### **Research Interests**

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- ❖ Machine learning/NLP/Deep Learning
- ❖ Quantitative Trait Loci
- ❖ Disease Risk Assessment
- ❖ Evolutionary Biology & Computation
- ❖ Epistatic Gene Interactions

### **Education**

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Postdoctoral Studies (T32), Human Genomics & Artificial Intelligence, University of Pennsylvania. 2019 - Present

- ❖ *Research:* Assessing opioid dependence and addiction risk from electronic health records using natural language processing
- ❖ *Principal Investigator:* Jason H. Moore, Ph.D.

Ph.D., Entomology, Kansas State University. 2018 (G.P.A. 4.0/4.0)

- ❖ *Thesis:* Identifying mechanisms of cold hardiness across metamorphosis in *Drosophila melanogaster*

❖ 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

## **Publications**

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**Freda, P.J.**, Moore, J.H., and Kranzler, H.R. 2021. The phenomics and genetics of addictive and affective comorbidity in opioid use disorder. *Drug and Alcohol Dependence*, <https://doi.org/10.1016/j.drugalcdep.2021.108602>

**Freda, P.J.**, Ali, Z., Heter, N., Ragland, G.J., and Morgan, T.J. 2019. Stage-specific phenotypic plasticity and genotype-by-environment interactions for cold and heat hardiness in *Drosophila melanogaster*. *Heredity*, <https://doi.org/10.1038/s41437-019-0236-9>

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*. nvy074, <https://doi.org/10.1093/ee/nvy074>

**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.

❖ In Progress

**Freda, P.J.**, Toxopeus, J., Dowle, E.J., Ali, Z.M., Heter, N., Lambert-Collier, R., Sower, I., Tucker, J.C., Morgan, T.J., Ragland, G.J. 2022. Transcriptomic and functional genetic evidence suggest distinct cold stress responses in a complex life cycle. Accepted pending revision. *Journal of Experimental Biology*.

## **Presentations**

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❖ Oral

**Freda, P.J.**, Morgan, T.J., and Ragland, G.J. 2018. Phenotypic, Genetic, and Transcriptomic Decoupling of Thermal Hardiness across Metamorphosis in *Drosophila melanogaster*. Kansas State University, Division of Biology Seminar Series, November 6<sup>th</sup>, 2018.

**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. 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

**Freda, P.J.**, Ali, Z., Heter, N., Morgan, T.J., and Ragland, G.J. 2018. Phenotypic and Genetic Decoupling of Thermal Hardiness across Metamorphosis. 59<sup>th</sup> Annual Drosophila Research Conference, Philadelphia, PA, April 11<sup>th</sup> – 15<sup>th</sup>, 2018.

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. Sigma Xi Undergraduate Research Forum, Manhattan, KS, April 21<sup>st</sup>, 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, Manhattan, KS. November 6<sup>th</sup> – 8<sup>th</sup>, 2015.

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

**Freda, P.**, DiMeglio, M., and Braverman, J.M. (2014). Temporal Variation at Microsatellite Loci in Wild-Caught *Drosophila simulans*. 12th Annual Ecological Genomics Symposium, Kansas City, MO, October 31<sup>st</sup> - November 2<sup>nd</sup>, 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, Philadelphia, PA, April 12<sup>th</sup>, 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. 5<sup>th</sup> Annual SEA-PHAGES Symposium, Janelia Farm Research Campus, Ashburn, VA. June 7<sup>th</sup> – 9<sup>th</sup>, 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, Philadelphia, PA, April 19<sup>th</sup>, 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<sub>2</sub>]. ASPB Plant Biology Meeting, Austin, Texas, July 20<sup>th</sup> – 24<sup>th</sup>, 2012.

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

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

## Grants and Fellowships

- ❖ Ruth L. Kirschstein Institutional National Research Service Award (NIH-T32), 2019
- ❖ 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
- ❖ HHMI GK-12 Fellowship, 2012 – 2014

## Awards/Certificates

- ❖ Certification: Mathematics for Machine Learning: Linear Algebra, Coursera, 2019
- ❖ Certification: Python for Everybody, Coursera, 2019

- ❖ 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

## **Research Techniques**

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*Computational:* NLP ❖ NGS/RNAseq pipelines ❖ GWAS ❖ PRS ❖ R ❖ Python ❖ Unix/Linux ❖ LaTeX

❖ Matlab/Octave ❖ Sequence alignment ❖ Sequence assembly ❖ Gene annotation ❖ NCBI: BLAST ❖ QTL mapping ❖ phylogenetics

*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

*Ecological and Organismic:* Organism collection and trapping (*Drosophila*) ❖ *Drosophila* rearing and care  
❖ *Drosophila* thermal stress assessment ❖ *Drosophila* larvae manipulation

## **Teaching Experience**

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*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**

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*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 Schieferrecke, Zainab Ali.

## **Professional Memberships**

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- ❖ 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**

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- ❖ 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
- ❖ Reviewer, *Entomologia Experimentalis et Applicata*, 2013
- ❖ Reviewer, *Biological Control*, 2014
- ❖ Reviewer, *Journal of Pest Science*, 2014
- ❖ Recognized reviewer, Elsevier, 2014-present
- ❖ Reviewer, *Genetica*, 2019
- ❖ Reviewer, *Heredity*, 2020
- ❖ Reviewer, *Journal of Neuroscience Research*, 2020
- ❖ Reviewer, *Scientific Reports*, 2020
- ❖ Reviewer, *Drug and Alcohol Dependence*, 2021
- ❖ 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**

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