Mary-Francis LaPorte

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Education

Ph.D. in Plant Biology, University of California, Davis, December 2024 (Expected)

BSc. in Plant Biology, *summa cum laude*, University of Oklahoma (OU), May 2019

Research Experience

Department of Plant Sciences, University of California, Davis *Davis, CA*

PhD Candidate; Advisor: Christine Diepenbrock, PhD *Sept. 2019 - Present*

- Identified genes related to both Kernel Color and Carotenoid concentration in maize grain by conducting a Genome Wide Association Study and Joint Linkage Analysis
- Implemented and compared Genomic Prediction methods to predict carotenoid traits in a maize association mapping panel, including parallelizing and adapting these methods for High-Performance Computing
- Implementing Crop Growth Models and Genomic Prediction methods to predict agronomic traits in a rice breeding program

Data, Analysis and Visualization Group, National Renewable Energy Lab *Golden, CO*

Practicum/Internship; Advisor: Ambarish Nag, PhD *July 2022 - May 2023*

- Analyzed the genomes of halophilic, halotolerant, and halophobic algal varieties using bioinformatic tools to explore genetic mechanisms for salt tolerance, with application for outdoor algae cultivation
- Utilized high-performance computing techniques for increasing the scale of comparative genomics applications
- Worked on developing a user-friendly app implementation of the analysis pipeline using Plotly's Dash App Library in Python

Department of Plant Biology and Microbiology, University of Oklahoma *Norman, OK*

Undergraduate Research Assistant; Advisor: Laura Bartley, PhD *2016 - 2019*

- Conducted lab/molecular techniques (including HPLC, Agrobacterium-mediated transformation, DNA & RNA extraction) to analyze the effects of *OsAT5* gene expression on the cell walls of *A. thaliana*
- Examined Switchgrass transcriptomic data using R, focusing on cell-wall related genes

Department of Molecular Plant Physiology, Utrecht University *Utrecht, The Netherlands*

Undergraduate Research Intern; Advisor: Henriette Schluepmann, PhD *Sept. 2017 - Dec. 2017*

- Purified and quantified RNA from *Azolla filiculoides* for a differential gene expression analysis

Publications

MF LaPorte, WB Suwarno, P Hannok, A Koide, P Bradbury, J Crossa, N Palacios-Rojas, CH Diepenbrock. 2024. "Investigating genomic prediction strategies for grain carotenoid traits in a tropical/subtropical maize panel." *G3: Genes, Genomes, Genetics*.

MF LaPorte, M Vachev, M Fenn, CH Diepenbrock. 2022. "Simultaneous dissection of grain carotenoid levels and kernel color in biparental maize populations with yellow-to-orange grain." *G3: Genes, Genomes, Genetics*

R Dale, S Oswald, A Jalihal, **MF LaPorte**, DM Fletcher, AH Hubbard, SH Shiu, A Nelson, A Bucksch. 2021. "Overcoming the challenges to enhancing experimental plant biology with computational modeling." *Frontiers in Plant Sciences*.

In Prep: Aug 2024: **MF LaPorte**, N Arora, S Clark, A Nag. 2024. "AlgaeOrtho, a bioinformatics tool for processing ortholog inference results in algae." *Preparing for submission*

Selected Invited Conference Talks

Summer 2024. *Learning from Kernels: High Performance Computing in Plant Breeding*. DOE-CSGF Program Review, Washington DC.

Summer 2024. *Lessons from the Black Box: Predictive Modeling and Biological Insights.* National Association of Plant Breeders, St. Louis, MO, USA.

Summer 2023. *Comparing genomic prediction models for (relatively) oligogenic traits: a case study in maize grain carotenoids*. Corteva Agriscience New Frontiers Conference, Johnston, IA.

Spring 2021. *Towards orange, biofortified maize: identifying genes associated with carotenoid traits and kernel color*. Corn Breeding Research Meeting. Virtual.

Programming Skills

R, Python, Shell Scripting, MATLAB, Version Control with Git, utilizing High Performance Computing, Plotly/Dash(Python)

Relevant Coursework

2020-2021	**Statistical Methods for Research I-II**, Project-based data analysis in R, especially causal inference techniques
2021	**Statistics: Machine Learning**, Mathematical theory and application of Python tools including sklearn and TensorFlow
2021	**Computer Science: Machine Learning**, Understanding and developing applications of machine learning models in python, including a class project using PyTorch in genomic prediction
2021	**Quantitative Genetics**, Applied quantitative genetics R packages (MASS, synbreed, etc) to animal and plant data
2021	**Advanced Plant Breeding**, Proposed a full hypothetical breeding program, from yearly germplasm optimization to IP
2022	**Programming Languages**, Studied the concepts behind lambda calculus, imperative programming, and language design
2022	**Large-Scale Scientific Computing**, Numerical algorithms and techniques for large-scale scientific computation, especially applications of fast-solvers in MATLAB

Awards, Fellowships, & Grants

2020 - 2024	**DOE-CSGF: Computational Science Graduate Fellowship**, U.S. Department of Energy
2023	**New Frontier Scholar**, Corteva Agriscience
2022	**Borlaug Scholar**, National Association of Plant Breeders
2019	**Dean's Distinguished Graduate Fellowship**, UC Davis College of Biological Science
2018	**Ronald Lehr Award for Undergraduate Research (Grand Prize)**, OU Phi Beta Kappa
2018	**Microbiology and Plant Biology Endowed Scholarship for Undergraduates**, OU Microbiology and Plant Biology Department
2017	**Effective Communication of Research Award**, Curiosity-to-Creativity Symposium, University of Oklahoma
2015 - 2019	**National Merit Scholarship**, University of Oklahoma

Teaching and Mentoring

2021-Present	**Software Carpentries**, Instructed seven multi-day workshops for learners (including undergraduates, graduate students, faculty, and staff researchers) in topics including: Python, R, version control with Git, data management and organization, SQL database management, hosted at institutions including the USDA, and Cal Poly Humboldt University
2022	**Undergraduate Mentoring**, Mentored an undergraduate student (Computer Science major) to apply the mathematically-complex Reproducing Kernel Hilbert Space Model to predict carotenoid traits in maize. Covered topics including plant breeding, genetics and genomics, linear algebra, and code implementation and optimization