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Executive Summary

- Microbiologist with 5 years of independent research experience in a trans-disciplinary environment focusing on recombinant protein expression, phylogenetics, and molecular modeling
 - Deep expertise with a variety of recombinant protein expression systems, advanced imaging techniques (AFM), microbial culturing
 - Fluent in R; expert in many bioinformatics methods including: phylogenetics of complex gene families, horizontal gene transfer inference, selection analysis, and computational modeling of proteins
 - Conceived of 3 independent projects as an undergraduate researcher and taught myself the computational techniques required to answer our questions; these projects resulted in two manuscripts ready for submission, and another currently in progress
 - Collaborated with experts in a wide variety of fields to formulate research questions and develop methods as a part of a large trans-disciplinary research center
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Education

BSc in Microbiology

The Pennsylvania State University

May 2017

Research

Research Technician

Department of Biology, Center for Lignocellulose Structure and Formation
The Pennsylvania State University

Advisor: Daniel J. Cosgrove

July 2017 - Present

- As a research technician with the trans-disciplinary Center for Lignocellulose Structure and Formation (CLSF), my time was split between independent projects and collaborative research with CLSF members. I collaborated with experts in fields ranging from polymer physics to

chemical engineering on hypothesis generation and methods development. I also trained and supervised two undergraduate students on cloning and heterologous protein expression. My independent research projects focused on better understanding the relationship between plant primary cell wall structure and plant growth. I designed molecular probes to examine the distribution of different polysaccharides in the cell wall and developed novel methods in Atomic Force Microscopy to obtain nanoscale images and nanomechanical maps of the cell wall. I also designed and implemented a new statistical workflow in R—including custom algorithms—for the processing and analysis of force spectroscopy data. We are currently analyzing the results of this project and expect two publications to result.

Collaborative Independent Research

June 2016 - Present

Collaborators: Lori Shapiro, Olga Zhaxybayeva, Rob Dunn, Daniel Cosgrove

- In early 2016, I began researching the distribution of expansin genes in non-plant species as an independent curiosity. The initial results were promising, and I reached out to Lori Shapiro and others to collaborate on the evolution of expansin genes. Through this project I taught myself new phylogenetic methods including the use of IQ-TREE to test and implement advanced evolutionary models, and application of duplication-transfer-loss (DTL) models to infer the evolutionary history of a gene. I also developed a novel method of inferring the relative age of horizontal transfer events and used R to analyze and visualize our phylogenies with associated data. This project is currently in preparation for submission. As a follow up, we have begun investigating the origin of expansins using phylogenetic networks, DTL models, and molecular dating.

Research Assistant

June 2013 - June 2017

Department of Biology

The Pennsylvania State University

Advisor: Daniel J. Cosgrove

- As an undergraduate, I worked in the Cosgrove lab designing and carrying out original research on the structure, function, and evolution of expansin proteins. I was tasked with heterologously expressing plant expansins—a goal which has eluded the cell wall community for 30 years. Like my predecessors, I was unsuccessful, but along the way I gained valuable experience in cloning, mutagenesis, protein purification, experimental design, and heterologous expression methods for bacteria, yeast, and algae. After numerous failed attempts, I proposed a computational solution to study expansin structure-function. This proposal was funded as a research grant by the Department of Biochemistry, and I carried out this research in collaboration with molecular modelers from our department, teaching myself sequence analysis and protein structural prediction along the way. This work resulted in a first author publication which is now submitted at New Phytologist.

Publications

1. **Chase, W. R., & Cosgrove, D. J.** (2018). Carbohydrate Binding Module Family 63. *CAZypedia*. cazypedia.org/index.php/Carbohydrate_Binding_Module_Family_63

2. **Chase, W. R.**, Yang, H., & Cosgrove, D. J. (2018). An in-silico structure of the expansin AtEXPA4 reveals unique biochemical features of α -expansin. *Manuscript submitted for publication*.
 3. **Chase, W. R.**, Mauck, K., Zhaxybayeva, O., Dunn, R. R., Cosgrove, D. J., Rocha, J., Kolter, R., & Shapiro S. R. (2018). From morphogenesis to pathogenesis: A cellulose loosening protein is one of the most widely distributed tools in nature. *Manuscript in preparation*.
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Awards

Summer Discovery Grant

May 2014

The Pennsylvania State University Department of Biochemistry and Molecular Biology
\$4000 awarded for independent research proposal

1st place in BMB category

September 2014

Undergraduate Research Exhibition

For poster: "*Predicting the 3D Structure of Alpha Expansins*"

Skills

Lab Skills

- DNA purification and PCR
- Cloning and heterologous protein expression
- Protein purification (affinity, ion exchange, FPLC)
- Immunobiochemistry (Western Blot, ELISA)
- Microbial culturing (bacteria, yeast, algae, diatoms, fungi)
- Plant histology
- Light and fluorescence microscopy
- Atomic Force Microscopy

Computational Skills

- R
- App development with Shiny
- HTML
- CSS
- Protein structure modeling and analysis
- Sequence analysis (BLAST, sequence alignment, etc)
- Phylogenetics (IQ-TREE, RAxML, PAML, SplitsTree)

Other

- Reproducible Research with Git/GitHub and Rmarkdown/Knitr
 - Fluent in Spanish and Portuguese
 - Development of new protocols and experimental design in a trans-disciplinary research group
 - Documentation, backup, and sharing of research notes using Microsoft OneNote and OneDrive
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References

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