

EDUCATION

- Ph.D. Biomedical Sciences and Clinical and Translational Sciences** July 2023
Penn State College of Medicine, Hershey, PA
- B.S. Biology** May 2010
University of Alabama, Tuscaloosa, AL

HONORS AND AWARDS

- TFS Cryo-EM Grant – Gold Recipient** May 2023
Thermo Fisher Scientific career development and community outreach grant award to fund graduate and post-doctoral cryo-EM projects, awarded for project “Visual Proteomics of Neuronal Growth Cones Using CryoET and Deep Learning Segmentation.”
- M&M Student Scholar Award** July 2022
Attendance and Travel award for the 2022 Microscopy and Microanalysis Conference, awarded for paper “*Phantoms Improve Robustness of Deep Learning Automated Segmentation in Cryotomography.*”
- TL-1 Training Grant** August 2019
The predoctoral TL1 training program in clinical and translational science is an NIH-funded program to help students learn the skills necessary to bridge the translational gap with research.

RESEARCH EXPERIENCE

- Application Specialist Intern** Jan 2023 to May 2023
Object Research Systems, Remote
- Developed marketing materials for Dragonfly software centered around CryoEM
 - Scripted and recorded in-depth tutorial video series “Dragonfly for CryoEM and VolumeEM”
 - Generated and documented extensive test cases for new features.
- Graduate Research Assistant** 2018 to Present
Swulius Lab, Penn State College of Medicine, Hershey, PA
- Investigated neuron development and cytoskeletal rearrangement using cryo-electron microscopy, confocal microscopy, and deep learning image segmentation.
 - Developed a workflow for high throughput segmentation of cryoEM data.
 - Assisted with developing software to simulate cryoEM data for training neural networks.
 - Applied deep learning segmentation to generate a visual proteome of rat hippocampal neuron growth cones.

Undergraduate Research Assistant
University of Alabama, Tuscaloosa, AL

2008 to 2010

- Museum collection organization, cataloguing, and database management.

WORK EXPERIENCE

Advanced Care Oncology Nurse

2012 to 2017

Veterinary Specialty and Emergency Center, Levittown, PA

- Advanced patient care
- Client education and support

PUBLICATIONS

Publications

Purnell, C., Heebner, J., Swulius, M., Hylton, R., Kabonick, S., Grillo, S., Grigoryev, S., Heberle, F., Waxham, N., Swulius, M., “Rapid Synthesis of Cryo-ET Data for Training Deep Learning Models,” bioRxiv, April 2023, doi:10.1101/2023.04.28.538636, *Nature Methods (Under Review)*

Heebner, J., Purnell, C., Hylton, R., Marsh, M., Swulius, M., “Deep Learning Based Segmentation of Cryo-Electron Tomograms,” *Journal of Visualized Experiments*, Nov 2022, doi:10.3791/64435.

Hylton, R., **Heebner, J.,** Grillo, M., Swulius, M., “Cofilin Filaments Regulate Filopodial Structure and Dynamics in Neuronal Growth Cones,” *Nature Communications*, May 2022, 13(1), doi:10.1038/s41467-022-30116-x

PRESENTATIONS AND INVITED LECTURES

Poster Presentation, “Expert- and Nonexpert-friendly Framework for Deep Learning Image Segmentation Demonstrates Successes Across Applications in vEM, CryoEM, MicroCT and Fluorescence Microscopy,” *Microscopy and Microanalysis*, July 2023

Invited Presentation, “Large Scale Segmentation of CryoET Data Using Dragonfly Segmentation Wizard,” Petr Chlanda Lab, Heidelberg, Germany (Zoom), April 2023

Invited Presentation, “Ultrastructural Insights into Cytoskeletal Filament Arrangement in Neuronal Growth Cones,” Dragonfly Users Conference, April 2023

Invited Presentation and Training Demonstration, “Dragonfly for Cryo-Electron Tomography – Practical Workshop,” University of Wisconsin-Madison, March 2023

Poster Presentation, “Convolutional Neural Network Segmentation of Bare and Decorated Actin Filaments in Cellular Cryo-Tomography,” Biophysical Society Annual Meeting, February 2023

Platform Presentation, “Phantoms Improve Robustness of Deep Learning Automated Segmentation in Cryotomography,” Microscopy and Microanalysis, August 2022

Poster Presentation, “Training Deep Learning Neural Networks with Simulated Tomographic Data,” Biophysical Society Annual Meeting, February 2020

PROFESSIONAL TRAINING

MicroED Workshop 2019

UCLA School of Medicine, Los Angeles, CA, December 9-12, 2019

Workshop to learn sample preparation, data collection, structure solving, and data analysis using the MicroED technique.

REFERENCES

Dr. Matthew Swulius

Assistant Professor

Biochemistry and Molecular Biology

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Dr. Richard Mailman

Distinguished Professor

Pharmacology and Neurology

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