

Julie McDonald

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Education

Massachusetts Institute of Technology, Cambridge, MA September 2020 – Present
PhD Student, Department of Biology

Wesleyan University, Middletown, CT September 2014 – May 2018
Bachelor of Arts, High Honors, Molecular Biology & Biochemistry Major with
Molecular Biophysics Certificate; **GPA - 3.75/4.0**
Thesis: “Thermodynamic Characterization of DNA Four-Way Junction Melting”

Research Experience

Massachusetts Institute of Technology, Cambridge, MA June 2022 – Present
Graduate Student, MIT Dept. of Biology
PI: Dr. Matthew Shoulders, Associate Professor of Chemistry

- Currently applying novel directed evolution technologies to improve enzymes and metabolic pathways in plants

Whitehead Institute, Cambridge, MA May 2021 – June 2022
Graduate Student, MIT Dept. of Biology
PI: Dr. Jing-Ke Weng, Associate Professor of Biology

- Developed multiple independent projects and collaborated with lab members to uncover the structure and functions of enzymes involved in plant secondary metabolism

Massachusetts General Hospital, Boston, MA July 2018 – Present
Research Technician, Dept. of Molecular Biology
PI: Dr. Luke Chao, Assistant Professor of Genetics

- Established and optimized a foundational set of protocols for the lab’s protein production pipeline, including fermentation of *Pichia pastoris* and membrane protein purification
- Independently researched regulation of the mitochondrial calcium uniporter using recombinant protein purification, analytical SEC, single particle cryo-electron microscopy, and negative staining
- Collaborated with researchers at MIT.nano and UMASS Medical School to establish a workflow for *in situ* tomography of organelles
- Navigated and troubleshoot softwares for cryo-electron microscopy, including SerialEM, FEI Manual User Interface, IMOD for tomography alignment, RELION, and CryoSparc

Wesleyan University May 2017 – May 2018
Research Assistant, Dept. of Molecular Biology & Biochemistry
PI: Dr. Ishita Mukerji, Fisk Professor of Natural Science

- Designed and implemented fluorescence spectroscopy experiments to study the thermodynamic characteristics of DNA structures linked to oncogenic instability
- Developed procedures for extracting secondary structural data from DNA melting curves and compiled experimental results into a comprehensive senior thesis

Teaching Experience

Massachusetts Institute of Technology

September 2021 – Present

Introductory Biology Teaching Assistant

- Led two recitation sections per week to advance students' learning of introductory biology concepts
- Designed practice problems and exam questions for the course
- Participated in a biology-specific pedagogy course to improve my own teaching strategy and create an inclusive classroom

Wesleyan University

September 2017 – May 2018

Biology Teaching Assistant

- Collaborated with students to find new ways to strengthen their understanding of foundational topics in biology
- Communicated with professors, students, and other teaching assistants to improve student engagement during lecture and help sessions

Publications

Ge, Y., Shi, X., Boopathy, S., McDonald, J., Smith, A. W., & Chao, L. H. (2020). Two forms of Opa1 cooperate to complete fusion of the mitochondrial inner-membrane. *eLife*, 9, e50973

Presentations

Poster: *BURP Domain Proteins and their Involvement in the Plant Stress Response*, Whitehead Institute for Biomedical Sciences Retreat (September 2021), Cambridge, MA.

Biophysical Society Meeting Poster and Abstract: **McDonald, J. L.**, Ge, Y., Navarro, P. P., & Chao, L. H. (2020). Visualizing Opa1-Mediated Changes to Inner Mitochondrial Membrane Morphology. *Biophysical Journal*, 118(3), 231a.

Poster: *Visualizing OPA1-Mediated Changes to Inner Mitochondrial Membrane Morphology by Cryo-Electron Tomography*, Massachusetts General Hospital Molecular Biology Retreat (October 2019), Falmouth, MA.

Poster: *Mitochondrial Membrane Fusion: Insights from a Model Membrane Platform*, New England Cryo-EM Conference (May 2019), Yale University.

Oral Presentation: *Understanding the Thermodynamics of DNA Four-Way Junction Melting*, Research Seminars in Molecular Biology (April 2018), Wesleyan University.

Poster: *Probing the Thermodynamic Stability of the Holliday Junction with 2-Aminopurine*, Summer Research Poster Session (July 2017), Wesleyan University.

Awards

High Honors in Molecular Biology and Biochemistry, *Wesleyan University*

Hawk Prize for Excellence in Biochemistry, *Wesleyan University*

Dean's list (4X), *Wesleyan University*

Marc N. Casper Summer Experience Grant, *Wesleyan University*

NESCAC and NFCA Scholar-Athlete, *NCAA*

American Society for Biochemistry and Molecular Biology Honor Society

Extracurriculars & Leadership

Expedition:Bio, Whitehead Institute

August 2021 – Present

- Mentored middle school students from the Cambridge area, explaining and conducting biology experiments such as DNA extractions

Wesleyan Advocates for Gender Equality

September 2015 – May 2018

- Designed and implemented projects, including bake sales and feminine hygiene product drives, to support domestic abuse shelters in Middlesex County, CT
- Consulted with university administration on protecting women from sexual assault and guaranteeing equal opportunity for women in the classroom

Wesleyan University Women in Science

September 2015 – May 2018

- Attended meetings with Wesleyan faculty members to discuss social issues facing the STEM community, especially in molecular biology and biochemistry

Wesleyan University Varsity Softball

September 2014 – May 2018

- Earned Jones Award/Team MVP for contributions to the team, All-NESCAC, and scholar-athlete recognition for excelling on the field and in the classroom