

SYDNEY OLIVIA SHUSTER

New Haven, CT | sydney.shuster@yale.com

PROFILE

Biophysical chemist and NSF Graduate Research Fellow (Yale PhD candidate, exp. 2027) with expertise in protein aggregation, imaging techniques, pathogen-relevant molecular mechanisms, and large-scale biological data analysis. Nine peer-reviewed publications spanning chemistry, biology, and biophysics. Proven record in federal science advocacy, science communication, and coalition-building. Motivated to apply technical and policy skills to engineered biological threat prevention, pandemic preparedness, and biosecurity field-building.

EDUCATION

Yale University — Ph.D. Candidate, Biophysical Chemistry New Haven, CT | 2021–2027 (exp.)
GPA 3.90 | NSF Graduate Research Fellowship | NIH Biophysics Training Grant | Yale Kirkwood Fellowship

Middlebury College — B.A. Chemistry (Minor: Mathematics), summa cum laude Middlebury, VT | 2015–2019
GPA 3.87 | High Honors Thesis | Buick Achievers Scholar | ACS Chapter President & Founder

RESEARCH EXPERIENCE

The Davis Group — Graduate Research Fellow Yale University | April 2022–Present
Advisor: Caitlin Davis, Ph.D.

- Developed live-cell super-resolution infrared microscopy to probe cellular metabolism and neurodegeneration
- Designed and executed Python-based analytical pipelines for hyperspectral imaging datasets, extracting quantitative biological insights from complex, high-dimensional data.
- Contributed to >\$1M in competitive grant funding (NIH R35, NSF CAREER, Beckman Young Investigators) through preliminary data, feasibility assessments, and technical writing
- Authored 6 publications (4 first-author) synthesizing findings across chemistry, biology, and physics.

National Heart, Lung, and Blood Institute — Intramural Research Training Awardee NIH, Bethesda, MD | 2019–2021
Advisor: Jennifer Lee, Ph.D.

- Pioneered protocols for expression, purification, and characterization of TDP-43 — a protein implicated in ALS — building core BSL-relevant laboratory and biosafety skills.
- Investigated amyloid formation and aggregate structure, contributing to understanding of how proteins misfold under stress
- Authored 2 first-author publications; operated independently within a federal research institution, gaining experience in NIH intramural governance and compliance.

Choi Laboratory — Undergraduate Research Assistant Middlebury College | 2017–2019
Advisor: Sunhee Choi, Ph.D.

- Characterized glycation and oxidative stress mechanisms in Alzheimer's-associated amyloid- β , with international collaboration (KAIST, South Korea).
- Applied LC-MS and absorbance spectroscopy; authored 2 publications and a high-honors thesis.

SCIENCE POLICY, ADVOCACY & COMMUNICATION

Federal Research Funding Advocacy Campaign Yale University / Local 33 UNITE HERE | 2025

- Partnered with Rep. Rosa DeLauro (Ranking Member, House Appropriations Committee) to collect hundreds of researcher testimonies on the impact of federal funding cuts to university science.
- Authored an op-ed in the Albany Times Union (tens of thousands of readers) articulating the public health and scientific consequences of research defunding, demonstrating science communication for lay audiences.
- Engaged legislators at local, state, and federal levels; led union documentation of researcher impacts, gaining direct experience translating scientific risk into policy-relevant language.

Science Advocacy Panels & Campaigns 2025–2026

- Panelist, GRAPHs Science Advocacy Day (2026); Panelist, 'Academic Repression in STEM and How We Can Resist It' (2025).
- Organized comment campaign against 'Duration of Status' rule change for international researchers (2025), mobilizing a scientific community around a federal policy threat.

SCIENTIFIC COMMUNICATION & FIELD-BUILDING

Graduate Writing Lab Fellow Yale Poorvu Center for Teaching and Learning | Aug 2023–Present

- Provide one-on-one writing mentorship to graduate students; design and lead workshop series on scientific writing, peer-review, and communication

New Haven Science Fair Mentor New Haven Public Schools | Oct 2021–Present

- Redesigned ninth-grade science curriculum; mentored a student to national/international science fair titles and a full-ride scholarship, demonstrating capacity for science outreach and STEM capacity-building.

Yale Pathways 'Tardigrades: Extreme Survivors' Workshop Organizer 2025–2026

- Designed and led a week-long hands-on science workshop for high-school students, translating complex biological resilience research into accessible public education.

Invited & Competitive Presentations (selected)

2021–2026

- Invited oral presentation, eurO-PTIR, Krakow, Poland (2025); Oral presentations at Biophysical Society National Meetings (2023, 2024); Outstanding Poster Award, Gordon Research Conference: Vibrational Spectroscopy (2024); Best Student Speaker, Yale Biophysics & Structural Biology Symposium (2023, 2026).

SELECTED PUBLICATIONS

Shuster S.O., Davis C.M. Incorporating *L*-cyanohomoalanine and *L*-azidohomoalanine into sfGFP using native *E. coli* machinery. Under Review. 2026.

Shuster S.O., Curtis A.E., Davis C.M. Optical photothermal infrared imaging using metabolic probes in biological systems. Analytical Chem. 2025.

Shuster S.O., Castillo H.B., Tarkegn L.H., Davis C.M. Oleic acid differentially affects lipid droplet storage of *de novo* synthesized lipids. Chem. Commun. 2024.

Shuster S.O., Burke M.J., Davis C.M. Spatiotemporal heterogeneity of *de novo* lipogenesis in fixed and living single-cells. J. Phys. Chem. B. 2023.

Shuster S.O., Lee J.C. Watching liquid droplets of TDP-43 CTD age by Raman spectroscopy. J. Biol. Chem. 2021.

Shuster S.O., Lee J.C. Tryptophan probes of TDP-43 C-terminal domain amyloid formation. J. Phys. Chem. B. 2021.

For complete publication list: <https://scholar.google.com/citations?user=3XQuWykAAAAJ&hl=en>

TECHNICAL SKILLS

Molecular & Cell Biology: Protein expression & purification, noncanonical amino acid incorporation, fluorescence spectroscopy, IR/Raman microscopy, LC-MS, BSL-2 cell culture techniques

Data & Computation: Python (hyperspectral & biological data pipelines), Unix, Igor, Adobe Illustrator, quantitative data analysis

Policy & Communication: Grant writing (>\$1M funded), op-ed authorship, legislative testimony coordination, science advocacy, curriculum design, peer-reviewed scientific writing

HONORS & AWARDS (SELECTED)

2021–2026 NSF Graduate Research Fellowship | **2022–2024** NIH Biophysics Training Grant | **2021–2025** Yale Kirkwood Fellowship | **2019–2021** NIH IRTA | **2026** Protein Society Finn Wold Travel Award | **2024** Outstanding Poster Award, Gordon Research Conference | Best Student Speaker, Yale Symposium (2023, 2026)