Andrew Eric Harrison Bazley

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Personal statement and research summary:
I am a cellular biophysicist researching how the endoplasmic reticulum regulates luminal biophysical properties. My dissertation research asks whether the abundant ER chaperone BiP acts as an ATP-driven regulator of luminal fluidity, which would connect a well-characterized enzymatic cycle to an emergent material property of the organelle. My work combines genetics and CRISPR editing, fluorescence microscopy (including live-cell single-particle tracking), and in vitro reconstitution. I write the software that analyzes these data and share it as open-source packages.

EDUCATION

New York University Grossman School of Medicine, New York, NY — 2019–present

Doctor of Philosophy, in progress — expected December 2026
Cell Biology and Biochemistry & Molecular Biophysics Training Programs (dual participation)
Advisor: Liam J. Holt, Ph.D. · Institute for Systems Genetics
Dissertation: *BiP activity tunes endoplasmic reticulum luminal diffusion*

Master of Philosophy — September 2022

The University of Texas at Austin, Austin, TX — 2014–2018

Bachelor of Science and Arts, Biochemistry; Minor in French — 2018
Bachelor of Arts, Plan II Honors — 2018
Honors thesis: *Functional Probing of the Polypeptide Exit Tunnel*
Advisors: Arlen Johnson, Ph.D. and Marc Lewis, Ph.D.

PUBLICATIONS

Peer-reviewed

1. Kagermazova L, Zhang W, Das B, Sharma S, **Bazley A**, Mermerian A, Holt LJ, Davoli T, Goldberg GS, Mita P, Chabes A, Arias Hernandez M, Regev O, Boeke JD. Cytoplasmic LINE-1 reverse transcriptase activity triggers DNA damage response and cell-cycle arrest. *Molecular Cell* (in revision, 2026).
2. Nuevo-Tapioles C, Qin Z, **Bazley A**, Branco C, Hamilton G, Kong X-P, Rothenberg E, Philips MR. KRAS4A promotes oligomerization of hexokinase 1 on mitochondria. *Cell Reports* 2026. doi:10.1016/j.celrep.2026.117392
3. Penev A, **Bazley A**, Shen M, Boeke JD, Savage SA, Sfeir A. Alternative splicing is a developmental switch for hTERT expression. *Molecular Cell* 2021. doi:10.1016/j.molcel.2021.03.033
4. Noval MG, Kaczmarek ME, Koide A, Rodriguez Rodriguez BA, Louie P, Tada T, Hattori T, Panchenko T, Romero LA, Teng KW, **Bazley A**, de Vries M, Samanovic MI, Weiser JN, Aifantis I, Cangiarella J, Mulligan MJ, Desvignes L, Dittmann M, Landau NR, Aguero-Rosenfeld M, Koide S, Stapleford KA. High titers of multiple antibody isotypes against the SARS-CoV-2 spike receptor-binding domain and nucleoprotein associate with better neutralization. *Scientific Reports* 2021;11:5538. doi:10.1038/s41598-021-84913-3

Preprints

5. Szoradi T, Shu T, Kidiyoor GR, Xie Y, Herzog N, **Bazley A**, Bonucci M, Keegan S, Saxena S, Ettefa F, Brittingham GP, Lemiere J, Fenyo D, Chang F, Delarue M, Holt LJ. nucGEMs probe the biophysical properties of the nucleoplasm. *bioRxiv* 2021.11.18.469159. doi:10.1101/2021.11.18.469159

Published abstracts

6. **Bazley A**, Chambers JE, Holt LJ. Single nanoparticle tracking in the endoplasmic reticulum lumen. *Biophysical Journal* 2022;121(3):537a.
7. Szoradi T, Shu T, Xie Y, et al. Genetically encoded multimeric (GEM) nanoparticles probe the biophysical properties of the nucleus. *Biophysical Journal* 2022;121(3):496a.
8. Nunes Evangelista N, **Bazley A**, Kato M, Archer R, Holt LJ, Chimura T, Kikuchi K, Ueno T, Takinoue M. Modulation of RNA transcription enzymatic activity based on the control of RNA polymerase diffusion inside DNA biomolecular condensates; abstract accepted for poster presentation: 2026 International Conference on Biophysics and Biomedical Sciences
9. Bakambamba K, Di Modugno F, Guilbard M, et al. Endoplasmic reticulum homeostasis—From molecules to organisms: report on the 14th International Calreticulin Workshop, Saint-Malo, France. *Journal of Cellular and Molecular Medicine* 2024;28:e17840.

SOFTWARE

Ingence — Python package (PyPI) and ingence.org 2026

- Read-only indexing and inference engine with a dashboard for research data collections. Developed and published under an Astera Institute Hidden Science Competition contract.

spt-pipeline — Python package (PyPI) 2026

- Manifest-driven single-particle tracking: detection and linking, fixed-tau step-size analysis, diffusion and MSD estimation, expression-marker intensity coupling, and publication-quality condition comparisons. Batch execution on SLURM/HPC.

bleachdt — Python package (PyPI) 2026

- Toolkit for FRAP analysis in phase-separated droplets, including bleach-depth and geometry corrections for condensate recovery kinetics.

GEMspa-CLI — Python package (PyPI) 2026

- Command-line batch processing for genetically encoded multimeric nanoparticle tracking, with MSD and ensemble diffusion analysis and visualization.

Unreleased laboratory infrastructure

- Frequency-domain FLIM analysis suite for Lambert Instruments Toggel data: phasor generation, reference scoring, rolling-shutter phase-gradient correction, and a twelve-flag QC framework.
- mp_analysis.py — mass photometry analysis suite for Refeyn TwoMP data: batch processing, automatic calibration-standard detection, replicate grouping, and cross-condition species comparison figures.
- Fiji/ImageJ macro library for batch ROI intensity extraction, channel-ratio analysis, and blinded-analysis randomization.

RESEARCH EXPERIENCE

Doctoral Research — Liam J. Holt Lab, Institute for Systems Genetics, NYU Langone Health April 2020–present

Dissertation: *BiP activity tunes endoplasmic reticulum luminal diffusion*

- Investigating whether the ER chaperone BiP, among the most abundant luminal proteins at near-millimolar concentration, tunes luminal fluidity through its ATPase cycle, which would link a well-characterized enzymatic mechanism to an emergent material property of the organelle.
- Built a reconstituted in vitro system that enriches purified BiP 20–50-fold into condensed droplets at near-physiological local concentration, to test how its enzymatic cycle affects material properties. By FRAP, BiP recovers more slowly in ATP than in ADP, and disrupting ATP hydrolysis or substrate binding appears to abolish this difference, suggesting that energy-dependent substrate engagement and transient network formation may contribute to droplet fluidity.
- Helped establish ER-targeted genetically encoded multimeric nanoparticles (ER-GEMs) as inert probes for single-particle tracking in the ER lumen. Acute calcium depletion, which disrupts BiP's chaperone activity, increases luminal fluidity within minutes, independently of UPR signaling. Cleaving BiP with the protease SubAB suppresses this effect.
- Found that genetic inactivation of BiP through its AMPylase FICD raises basal luminal diffusion and dampens calcium-induced fluidization, suggesting that AMPylation may help regulate ER rheology.
- Built and maintain the laboratory's single-particle tracking, FLIM, and mass photometry analysis infrastructure, released as open-source packages (see Software).

COVID-19 Research Volunteer — NYU Langone Health, New York, NY March 2020–March 2021

- Developed a virus-like particle candidate for preclinical evaluation as a SARS-CoV-2 vaccine.
- Contributed to a second-generation serological assay with improved sensitivity and specificity.

Graduate Rotation — Shohei Koide Lab, NYU Langone Health January–April 2020

- Engineered pH-dependent substrate affinity into a targeting vehicle for cancer immunotherapy.

Graduate Rotation — Liam J. Holt Lab, NYU Langone Health September–December 2019

- Measured the effect of osmotic shock on macromolecular crowding in the cytoplasm.

Graduate Rotation — Agnel Sfeir Lab, NYU Langone Health June–September 2019

- Dual-luciferase screening to identify alternative splicing factors regulating hTERT.

Research Assistant II — Kenneth Johnson Lab, UT Austin, Austin, TX January–May 2019

- Purified DNA polymerase gamma and pathogenic variants and performed pre-steady-state kinetic analysis.

Undergraduate Research — Arlen Johnson Lab, UT Austin, Austin, TX January 2016–December 2018

- Thesis project on the role of the biogenesis factor Nog1 in quality control of the ribosomal polypeptide exit tunnel; found the Nog1 C-terminal domain to be largely insensitive to conformational defects in the tunnel, arguing against a surveillance role for that domain.
- Generated double-mutant strains carrying deletions in both large- and small-subunit ribosomal proteins to test whether translational fidelity is restored when individually deleterious defects are combined.
- Mutagenesis of Ski7 to map interactions essential to the 3'-to-5' mRNA degradation machinery.

Research Intern — Jeffrey Myers Lab, MD Anderson Cancer Center, Houston, TX Summer 2017

- Preclinical evaluation of a novel chemotherapy combination in four HPV-positive squamous cell carcinoma lines, using cytotoxicity assays, immunoblotting, cell-cycle flow cytometry, and qRT-PCR to establish the mechanism of DNA damage and cell death.

Undergraduate Research — Marc Lewis Group and Ted Mills Lab, UT Austin October 2014–Summer 2016

- Studied how the eukaryotic heat shock response protects cells against cryoprotectant toxicity in organ transport, using flow-cytometry cell death and growth assays, time-course drug treatments, and immunoblotting for markers of heat shock, DNA damage, and apoptosis.

CPRIT Undergraduate Summer Fellow — Edward Marcotte Lab, UT Austin Summer 2015

- Assayed complementation of human ribosome biogenesis factors by their *S. cerevisiae* orthologs to evaluate yeast as a model for cancer-related gene function. Mentored by Jon Laurent, Ph.D.

FELLOWSHIPS, GRANTS, AND HONORS

Hidden Science Competition, winning proposal and contract award, Astera Institute	2026
NIH National Research Service Award T32 Fellowship (PI: Susan Smith, Ph.D.)	2021–2023
NSF Graduate Research Fellowship Program, Honorable Mention	2021
Texas Institute for Discovery Education in Science (TIDES) Summer Fellowship	Summer 2018
Undergraduate Presenter Award in Cell and Molecular Biology	September 2018
Texas Exes Undergraduate Scholarship	Fall 2018
Plan II Honors Thesis Grant	March 2018
The University of Texas at Austin Undergraduate Research Fellowship	April 2017
Cancer Prevention and Research Institute of Texas (CPRIT) Summer Fellowship	Summer 2016
Forty Acres Scholars Program — merit-based full scholarship, UT Austin	2014–2018
Stamps Family Charitable Foundation Leadership Scholarship	2014–2018
Dean's List, College of Liberal Arts, UT Austin (eight semesters)	2014–2018

PRESENTATIONS

Unnatural condensates: biophysical characterization beyond the cell May 2025
Invited talk, ISG Nano Seminar, Institute for Systems Genetics, NYU Langone Health

Monitoring BiP oligomerization with intra-oligomer FLIM-FRET March 2024
Talk, North Atlantic Microscopy Society

Single-molecule dynamics characterize ER luminal diffusion October 2023
Poster, 4th Annual Endoplasmic Reticulum Symposium, Paris, France

Regulation of mesoscale diffusion in the endoplasmic reticulum May 2023
Talk, 14th International Calreticulin Workshop, Saint-Malo, France

Single nanoparticle tracking in the endoplasmic reticulum lumen February 2022
Poster, Biophysical Society 66th Annual Meeting

Endoplasmic reticulum responding to compressive stress December 2020
Poster, American Society for Cell Biology, Cell Bio Virtual Meeting

Compressive stress and the protein secretory pathway October 2020
Talk, Membrane Trafficking Online Community

Functional probing of the polypeptide exit tunnel September and November 2018
Talks, Fall Undergraduate Research Symposium and Plan II Honors Thesis Symposium, Austin, TX

Preclinical evaluation of a novel chemotherapy treatment in squamous cell carcinoma August 2017
Talk, MD Anderson Summer Research Presentation, Houston, TX

Optimization of ssDNA concentration in S. cerevisiae plasmid transformations December 2016
Poster, UT Austin Biostatistics Research Poster Session, Austin, TX

Modeling human disease-associated mutations in S. cerevisiae August 2015
Poster, CPRIT Summer Symposium, Austin, TX

MENTORING AND TEACHING

Trainees mentored

Nathan Nunes Evangelista, visiting doctoral student (Takinoue Lab) Spring 2025

- Trained in single-molecule tracking, fluorescence microscopy, and biochemistry for a DNA-origami condensate project; co-author on the resulting conference abstract.

Stephanie Figueroa Reyes, NYU Langone Summer Undergraduate Research Program (Cornell University) Summer 2024

- Repurposed a cytoplasmic ATP/ADP ratiometric sensor for the ER lumen, from construct design through cloning and validation, producing a tool the lab did not previously have. Also contributed to cloning of yeast ER-GEMs.

Will Jogia, doctoral rotation student — now Ph.D. student, Jonas Schluter Lab Summer 2022

- Characterized the ER luminal diffusion landscape under ER stress and UPR activation, combining ER-GEM tracking, FRAP, RUSH secretion assays, and crowding simulations.

Raya Jallad, doctoral rotation student — now Ph.D. Fall 2020

- Correlated mechanical and osmotic compression with cytoplasmic and ER pH and calcium dynamics using GEM tracking alongside genetically encoded and dye-based ion reporters.

Teaching

Teaching Assistant, Peer Review in the Life Sciences, NYU Grossman School of Medicine Fall 2023

Teaching Assistant, Data Analysis and Biostatistics with R, NYU Grossman School of Medicine Fall 2022

Outreach and science education

Scientist-in-Residence, New York Academy of Sciences July 2020–May 2021

- Co-developed and taught a science curriculum with a faculty partner at Simon Baruch Junior High School M104, guiding students through independent research projects.

Founder, NYU Life Sciences Journal Club January 2020–May 2021

- Founded and ran a monthly journal club introducing undergraduates to primary literature.

Mentor, NYU Graduate-Undergraduate Mentorship Program September 2019–May 2020

Volunteer Instructor, NYU Women in Science Middle School Science Engagement Program October 2019–2020

PROFESSIONAL SERVICE

Peer reviewer, *Science* (co-review with L. J. Holt) 2025

Peer reviewer, *PNAS* (co-review with L. J. Holt) 2024

Panel organizer and host, Scientist Immersion Program, NYU Langone Health July–August 2021

- Organized and moderated a STEM careers panel for students from underrepresented backgrounds.

Recruitment Committee, Forty Acres Scholars Program, UT Austin 2016–2018

ADVANCED TRAINING

Analytical and Quantitative Light Microscopy (AQLM), Marine Biological Laboratory, Woods Hole, MA April–May 2022

- Selective intensive course covering the theory and practice of quantitative light microscopy.

TECHNICAL SKILLS

Microscopy Single-particle tracking; FRAP; FLIM and FRET (time-domain TCSPC and frequency-domain); confocal and spinning-disk; HILO/TIRF; live-cell time-lapse; quantitative image analysis.

Biophysics Mass photometry (Refeyn TwoMP); in vitro reconstitution and phase separation; ATPase and enzyme kinetics; recombinant protein expression and purification; microfluidic and microchannel assay design.

Cell & molecular Mammalian and yeast culture; HaloTag and self-labeling-tag chemistry; molecular cloning and mutagenesis; flow cytometry; immunoblotting; qRT-PCR; lentiviral transduction.

Computational Python (NumPy, SciPy, pandas, trackpy, scikit-image, napari, matplotlib); R; Fiji/ImageJ macro; SLURM/HPC batch processing; Git and GitHub; Python packaging and distribution.

Languages English (native); French (proficient speaking and writing).