Josselyn Lorena Mata Calidonio

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PROFESSIONAL SUMMARY

Ph.D. candidate with 4.5+ years of experience in **nanotechnology, assay development, and diagnostics,** with a track record of bridging biology, engineering, and computation to drive innovative healthcare solutions.

TECHNICAL EXPERTISE

- **Assay Development & Diagnostics:** Multiplexed assay design and validation; rapid and point-of-care diagnostics; FRET-based assays; antibody bioconjugation; experimental optimization and analytical validation.
- **Molecular & Cellular Engineering:** Molecular cloning, plasmid design, mammalian cell culture, protein expression, and purification; experience operating in BSL-2 and BSL-2+ environments.
- **Nanotechnology & Biophysical Characterization:** Nanoparticle synthesis and functionalization; characterization using DLS, UV-Vis spectroscopy, Raman/SERS, and Microscale Thermophoresis.
- **Computational & Data Analysis:** Image analysis, signal processing, machine learning, and statistical modeling; biostatistics and linear algebra-based analysis; data-driven assay development and pattern recognition.
- **Instrumentation, Fabrication & Prototyping**: Circuit design and electronics; 3D modeling/printing, laser cutting.
- **Programming & Software:** Python, MATLAB, R, C/C++; LabVIEW, OriginLab, ImageJ, Fusion 360, SPICE; data analysis and visualization workflows.
- **Collaboration & Research Translation**: Cross-functional collaboration; strong scientific communication and project execution; scientific writing and reporting; mentorship and leadership; interdisciplinary work.

KEY ACHIEVEMENTS

- **Multiplexed Diagnostic Development:** Designed and validated a multiplexed lateral flow diagnostic capable of simultaneously detecting 15+ viral targets using gold nanoparticle–antibody conjugates through novel pattern-based identification of emerging pathogens.
- **Therapeutic Nanotechnology:** Developed a nanoparticle-based vaccine platform for fungal infection in amphibians, where I gained cross-disciplinary experience in biological targeting & translational therapeutic design.
- **Space Pharmacy launch with SpaceX and NASA:** Contributed to the design and validation of 19 microfluidic diagnostic and chemical synthesis systems **launched to the International Space Station** (SpaceX CRS-27, NASA), supporting autonomous biomanufacturing and diagnostic workflows in extreme environments.
- **Clinical-Partnered Diagnostic Validation:** Led a multi-institutional collaboration to validate a multiplexed immunoassay for differential detection of dengue virus serotypes using real human clinical samples, involving iterative assay optimization, large-scale data analysis, and performance evaluation under real-world conditions.

EDUCATION

UNIVERSITY OF MASSACHUSETTS BOSTON — Boston, MA | June 2021- May 2026
Doctor of Philosophy in Integrative Bioscience; Biophysics Track — **GPA: 3.97**
- Dissertation: *Patterned Sensing for the Unknown: Lateral Flow Detection of Emerging Infectious Diseases*

EASTERN NAZARENE COLLEGE — Quincy, MA | August 2017- May 2021
Bachelor of Science, Double Major in Electrical Engineering and Mathematics — **GPA: 3.99**

PROFESSIONAL EXPERIENCE

GRADUATE RESEARCHER, UMASS BOSTON — Boston, MA| June 2021 – Present
- Designed, developed, and validated multiplexed diagnostic assays using nanoparticle–antibody conjugates, colorimetric and SERS-based readouts, and novel biosensing architectures for infectious disease detection.
- Led assay development cycles, from initial design through iterative optimization, performance characterization, & real-sample testing, addressing challenges such as signal interference, matrix effects, & cross-reactivity.
- Built data analysis and machine learning pipelines (Python, MATLAB) for quantitative interpretation of complex biosensor outputs, enabling extraction of diagnostic signatures from high-dimensional biological data.

ASSAY DEVELOPMENT INTERN, NANOPATH DX Cambridge, MA| May 2023 – August 2023

- Developed rapid diagnostic platforms using nanoparticles and nucleic acid hybridization for sensitive viral, bacterial, and fungal pathogen detection.
- Optimized assays and formulations, performing quantitative data analysis to enhance accuracy and reproducibility.
- Validated assay sensitivity and specificity to improve diagnostic reliability for regulatory and clinical use.

ENGINEERING TEACHING ASSISTANT, UMASS BOSTON Boston, MA | January 2024 – May 2024

- Supported student labs focused on digital circuit design using logic gates, flip-flops, and FPGAs.
- Guided 60 students in troubleshooting, Boolean algebra, and digital measurement tools.

ELECTRONICS TEACHING ASSISTANT, EASTERN NAZARENE COLLEGE Quincy, MA | August 2020 – May 2021

- Led lab instruction in analog/digital electronics and SPICE simulation software.
- Mentored students on course content and lab report development.

RESEARCH INTERN, NASA AMES & EASTERN NAZARENE COLLEGE Quincy, MA | Summer 2018 – 2019

- Investigated geochemical and atmospheric changes pre/post simulated earthquakes to identify predictive signals.
- Presented results to NASA members, invited guests, and the public to communicate research findings.

PUBLICATIONS- ORCID #: 0000-0002-4818-2638

- **Mata Calidonio, J.,** Kurosawa, J., Mathewson, K., & Hamad-Schifferli, K. Using Surface Enhanced Raman Spectroscopy for the detection and differentiation of Dengue Serotypes. (2026) *In Progress*
- **Mata Calidonio, J**., Gomez-Marquez, J., & Hamad-Schifferli, K. S Plug and play control of gold NP synthesis using reconfigurable paper-fluidic membranes, Methods in Molecular Biology. *Nanoparticles in Biology and Medicine*, Third Edition (2025), *In submission*
- **Mata Calidonio, J.,** Mathewson, K. J. & Hamad-Schifferli, K. Extending Selective Arrays for Infectious Disease Detection. Anal Chem (2025) doi:10.1021/acs.analchem.5c03084.
- **Mata Calidonio, J**. & Hamad-Schifferli, K. Redefining antibody cross-reactivity as an advantage for sensing and diagnostics. *Trends Biotechnology* (2025) doi: 10.1016/j.tibtech.2025.05.017.
- **Mata Calidonio, J**. et al. Development of an Immunoassay for Highly Pathogenic Avian Influenza (H5N1) across Diverse Sample Matrices. *ACS Nanoscience Au* (2025) doi:10.1021/acsnanoscienceau.4c00072.
- **Mata Calidonio, J**., Maddox, A. I. & Hamad-Schifferli, K. A novel immunoassay technique using principal component analysis for enhanced detection of emerging viral variants. *Lab Chip* 24, 3985–3995 (2024). doi: 10.1039/D4LC00505H
- **Mata Calidonio, J**. & Hamad-Schifferli, K. An approach to use machine learning to optimize paper immunoassays for SARS-CoV-2 IgG and IgM antibodies. *Sensors & Diagnostics* 3, 677–687 (2024). doi: 10.1039/D3SD00327B
- **Mata Calidonio, J**., Gomez-Marquez, J. & Hamad-Schifferli, K. Paper-Powered Synthesis of Gold Nanoparticles and Metronidazole for Bioassays. *ACS Appl Nano Mater* (2024). doi:10.1021/acsanm.4c01669.
- Quinn, S., **Mata Calidonio, J**. & Hamad-Schifferli, K. Green and Sustainable Paper-Based Sensing Systems Using Nanoparticles. *Reference Module in Chemistry, Molecular Sciences and Chemical Engineering (Elsevier, 2024).* doi:10.1016/B978-0-443-15742-4.00036-3.
- **Mata Calidonio, J**. & Hamad-Schifferli, K. Biophysical and biochemical insights in the design of immunoassays. *Biochim Biophys Acta Gen Subj* 1867, (2023). doi: 10.1016/j.bbagen.2022.130266
- **Mata Calidonio, J**., Gomez-Marquez, J. & Hamad-Schifferli, K. Nanomaterial and Interface Advances in Immunoassay Biosensors. *The Journal of Physical Chemistry C* 126, 17804–17815 (2022). doi: 10.1021/acs.jpcc.2c05008
- **Mata Calidonio, J**. Signal Processing Application to Tremor Quantification and Diagnosis. *J Young Investigator* 41, (2022). doi: 0.22186/jyi.41.1.1-6.

CONFERENCES

- **Mata Calidonio, J.,** (presenter), et. al, "A novel immunoassay technique using principal component analysis for enhanced detection of emerging viral variants." Pittcon, Boston, MA, 2025
- **Mata Calidonio, J**., (presenter), et. al, "A novel immunoassay technique using principal component analysis for enhanced detection of emerging viral variants." American Chemical Society, Denver, CO, 2024

- Gomez-Marquez, J., (presenter), **Mata Calidonio, J**. (Q&A participation), & Hamad-Schifferli, Kimberly., "Ampli Powered Papermechanical Synthesis in Space: Results from a new approach biopharmaceutical synthesis in LEO / In Space Mfg", International Space Station Research and Development, Boston, MA, 2024.
- **Mata Calidonio, J.,** (presenter), et. al, "Paper Powered Pharmaceutical Manufacturing" sound bite, New England Complex Fluids, Brandeis University, MA, Sept. 2022.

AWARDS

- 2x ORACLE Doctoral Research Fellowship Award, University of Massachusetts Boston, 2024-2025. Award: $13,000, total: $26,000.

PROFESSIONAL MEMBERSHIPS

- American Chemical Society (ACS) member
- Society of Women Engineers (SWE) member
- Society of Hispanic Professional Engineers (SHPE) member

MENTORSHIPS

- Mentored twelve undergraduate students in different areas like computer vision, engineering design, lateral flow assay creation, and microfluidic devices.
- Participated in the Institute of Diversity Sciences (IDS) Fellowship Program to increase diversity in the STEM field by mentoring undergraduate students through research and graduate school opportunities.
- Mentored students through scientific research for the U54 University of Massachusetts Boston- Dana Farber/ Harvard Cancer Center (UMB-DF/HCC) program to improve opportunities for under-represented minority students.

VOLUNTEERING

- Volunteer helping children with cancer, *Christopher's Haven*, Boston, MA — August 2024- Present
- Guest services team leader, *Aletheia Church*, Cambridge, MA — November 2021- May 2024 | March 2026- Present
- Volunteer at ministry for the homeless, *Lion of Judah Church*, Boston, MA — 2024, 2025
- Equipment team volunteer, *Grace City Church*, Brookline, MA — January 2025- May 2025

REFERENCE CONTACTS

Kimberly Hamad-Schifferli, PhD (PhD Research Advisor, Professor)
University of Massachusetts Boston
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Nichola Hill, PhD (Secondary PhD Research Advisor, Professor)
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