Josselyn Lorena Mata Calidonio

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PROFESSIONAL SUMMARY

Ph.D. candidate with 4+ years of experience in **nanotechnology, assay development, and diagnostics,** with a track record of bridging biology, engineering, and computation to drive innovative healthcare solutions.

AREAS OF EXPERTISE

- Assay Development & Validation
- Nanotechnology & Bioconjugation
- Rapid & Point-of-Care Diagnostics
- Molecular Cloning & Cell Culture
- Protein Expression & Purification
- Cross-functional Collaboration
- Biophysical Characterization
- Translational Research
- AI & Computational Analysis

KEY ACHIEVEMENTS

- **Multiplexed Diagnostic Development**: Designed and validated lateral flow assays incorporating gold nanoparticles and cross-reactive antibodies for **simultaneous detection of 15+ viruses in one test**.
- **Therapeutic Nanotechnology**: Developed a nanoparticle vaccine against fungal infection in salamanders and gained cross-disciplinary insight into nanoparticle-based drug delivery through collaborative research discussions.
- **AMPLI Space Pharmacy launch with SpaceX and NASA**: Contributed to the development of 19 microfluidic diagnostic and chemical synthesis experiments launched aboard the International Space Station (**SpaceX CRS-27, March 14th, 2023**), supporting sustainable biomanufacturing approaches for global health applications.
- **Global Health–Oriented Diagnostics Design**: Engineered 6 low-cost, field-deployable diagnostic platforms to improve accessibility of infectious disease detection in resource-limited settings.

EDUCATION

UNIVERSITY OF MASSACHUSETTS BOSTON Boston, MA | June 2021- May 2026

Doctor of Philosophy in Integrative Bioscience; Biophysics Track **GPA: 3.97**

- Relevant Coursework: Biomedical Signaling & Image Processing, Cancer Biophysics, Immunology, Biostatistics & Experimental Design, Thermodynamics & Stat. Mechanics, Applied Machine Learning, Scientific Communication

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 RESEARCH ASSISTANT, UMASS BOSTON Boston, MA| June 2021 – Present

- Conducted 15+ independent research projects in nanotechnology-based diagnostics and sensors, focusing on assay development, biosensor engineering, and data-driven optimization for pathogen detection.
- Implemented image processing and machine learning pipelines to develop diagnostics more effectively and analyze assay outputs, resulting in tests with 90%+ accuracy and faster development timelines.
- Collaborated with interdisciplinary teams to design, execute, and present experimental studies, contributing to 10 peer-reviewed publications and 4 conference presentations.

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**., 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 progress*
- **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. in *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.

SKILLS

- Technical Skills:
    - Dry Lab: Image analysis, signal processing, machine learning and linear algebra analysis algorithms, biostatistics, 3D modeling/printing, laser cutting, circuitry, data analysis.
    - Wet Lab: Cloning, plasmid design, mammalian cell culture and protein expression, protein purification, nanoparticle synthesis, antibody bioconjugation, PCR, gel electrophoresis, DLS, UV-VIS spectroscopy, Raman/SERS, Microscale Thermophoresis. BSL2 and BSL2+ training.
    - Software: LabView, Fusion 360, OriginLab, ImageJ, Inkscape, SPICE, Canva, Microsoft Office.
    - Programming: Python, C, C++, R, MATLAB, HCS12 Assembly.
- Soft Skills: communication and collaboration, leadership, creativity, adaptability, teamwork, problem solving, work ethic, time management.
- Languages: Fluent English and Spanish; basic Mandarin Chinese.

MENTORSHIPS

- Mentored eleven 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
- 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
- Guest services team leader, *Aletheia Church*, Cambridge, MA — November 2021- May 2024

REFERENCE CONTACTS

Kimberly Hamad-Schifferli, PhD (Research Advisor, Professor)
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