

Ryann Joseph

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EDUCATION

Harvard University - *Doctor of Philosophy*

Aug 2025 - May 2031 (expected)

Bioengineering (School of Engineering and Applied Science)

University of Pennsylvania - *Bachelor of Science in Engineering*

Aug 2021 - May 2025

Major: Bioengineering (School of Engineering and Applied Science) | **Minors:** Mathematics, Chemistry

RESEARCH EXPERIENCE

Mooney Lab: Laboratory for Cell and Tissue Engineering - Harvard University | PhD student

Aug 2025 - present

Mitchell Lab: Overcoming Biological Barriers to Drug Delivery - University of Pennsylvania | Research Asst.

Jan 2022 - Aug 2025

- Collaborated with graduate bioengineers to maximize drug delivery intracellularly via LNPs
- Pioneered projects for Pfizer (solid tumor delivery) and for the Cystic Fibrosis Foundation (novel therapeutic gene editing)

PUBLICATIONS

1. Lipid nanoparticle co-delivery of mRNA and a small molecule drug for oral cancer chemoimmunotherapy

Marshall S. Padilla, Jacqueline J. Li, Qunzhou Zhang, Korey Patwari, Shihong Shi, Hannah M. Yamagata, [Ryann A. Joseph](#), Briyanna N. Hymms, Sridatta V. Teerdhala, Mohamad-Gabriel Alameh, Drew Weissman, Anh D. Le, Michael J. Mitchell
BioRxiv 2025 10.1101/2025.09.26.678832

2. Liver-detargeted aromatic bioeducible mRNA lipid nanoparticles confer lymph node tropism and robust antigen-specific immunity

Hannah Yamagata, Marshall Padilla, Alex Hamilton, Kelsey Swingle, Adele Ricciardi, Ajay Thatte, Hannah Geisler, [Ryann Joseph](#), Anushka Agrawal, Ori Chalom, Jacqueline Li, Sherry Du, Dongyoon Kim, Ricardo Whitaker, Christian G Figueroa-Espada, Emily Han, Amanda Murray, Mohamad-Gabriel Alameh, Drew Weissman, Michael Mitchell
Journal of the American Chemical Society 2025 *In revision*

3. High-throughput in vivo screening using barcoded mRNA identifies lipid nanoparticles with extrahepatic tropism for cancer immunotherapy

Alex G. Hamilton, Ajay S. Thatte, Junchao Xu, Zhangyi Luo, Hannah C. Safford, Kelsey L. Swingle, Jenna Muscat-Rivera, Michael Kegel, Xuexiang Han, [Ryann A. Joseph](#), Amanda M. Murray, Hannah C. Geisler, Ricardo C. Whitaker, Lulu Xue, Roman Spektor, Jilian R. Melamed, Drew Weissman, Michael J. Mitchell
Advanced Materials 2025 10.1002/adma.202514370

4. Elucidating lipid nanoparticle properties and structure through biophysical analyses

Marshall S. Padilla, Sarah J. Shepherd, Andrew R. Hanna, Martin Kurnik, Xujun Zhang, Michelle Chen, James Byrnes, [Ryann A. Joseph](#), Hannah M. Yamagata, Adele S. Ricciardi, Kaitlin Mrksich, David Issadore, Kushol Gupta & Michael J. Mitchell
Nature Biotechnology 2025 10.1038/s41587-025-02855-x

5. Cas9 protein outperforms mRNA in lipid nanoparticle-mediated CFTR repair

[Ryann A. Joseph](#), Rebecca M. Haley, Marshall S. Padilla, Adele S. Ricciardi, Hannah M. Yamagata, Michael J. Mitchell
Nano Letters 2025 10.1021/acs.nanolett.5c03548

6. Ionizable Lipid Nanoparticles with Functionalized PEG-Lipids Increase Retention in the Tumor Microenvironment

Matthew Jester, Rebecca Haley, Margaret Billingsley, Christian Figueroa-Espada, [Ryann Joseph](#), Xuexiang Han, Michael Mitchell
Molecular Therapy-Methods & Clinical Development 2025 10.1016/j.omtm.2025.101457

7. Lipid Nanoparticles for In Vivo Lung Delivery of CRISPR-Cas9 Ribonucleoproteins Allow Gene Editing of Clinical Targets

Rebecca M Haley, Marshall S Padilla, Rakan El-Mayta, [Ryann A Joseph](#), Jesse A Weber, Christian G Figueroa-Espada, Alvin J Mukalel, Adele S Ricciardi, Rohan Palanki, Hannah C Geisler, Matthew T Jester, Beverly L Davidson, Michael J Mitchell
ACS Nano 2025 10.1021/acsnano.4c16617

8. Placenta-tropic VEGF mRNA lipid nanoparticles ameliorate murine pre-eclampsia

Kelsey L. Swingle, Alex G. Hamilton, Hannah C. Safford, Hannah C. Geisler, Ajay S. Thatte, Rohan Palanki, Amanda M. Murray, Emily L. Han, Alvin J. Mukalel, Xuexiang Han, [Ryann A. Joseph](#), Aditi A. Ghalsasi, Mohamad-Gabriel Alameh, Drew Weissman, Michael J. Mitchell
Nature 2024 10.1038/s41586-024-08291-2

9. **Lipid nanoparticle-mediated RNA delivery for immune cell modulation**
Emily H. Kim, Sridatta V. Teerdhala, Marshall S. Padilla, **Ryann A. Joseph**, Jacqueline J. Li, Rebecca M. Haley, Michael J. Mitchell
European Journal of Immunology 2024 10.1002/eji.202451008
10. **High-Throughput In Vivo Screening Identifies Differential Influences on mRNA Lipid Nanoparticle Immune Cell Delivery by Administration Route**
Alex G. Hamilton, Kelsey L. Swingle, Ajay S. Thatte, Alvin J. Mukalel, Hannah C. Safford, Margaret M. Billingsley, Rakan D. El-Mayta, Xuexiang Han, Benjamin E. Nachod, **Ryann A. Joseph**, Ann E. Metzloff, Michael J. Mitchell
ACS Nano 2024 10.1021/acsnano.4c01171
11. **Influence of ionizable lipid tail length on lipid nanoparticle delivery of mRNA of varying length**
Kaitlin Mrksich, Marshall S. Padilla, **Ryann A. Joseph**, Emily L. Han, Dongyoon Kim, Rohan Palanki, Junchao Xu, Michael J. Mitchell
Journal of Biomedical Materials Research 2024 10.1002/jbm.a.37705
12. **Ionizable lipid nanoparticles with integrated immune checkpoint inhibition for mRNA CAR T cell engineering**
Alex G. Hamilton, Kelsey L. Swingle, **Ryann A. Joseph**, David Mai, Ningqiang Gong, Margaret M. Billingsley, Mohamad-Gabriel Alameh, Drew Weissman, Neil C. Sheppard, Carl H. June, Michael J. Mitchell
Advanced Healthcare Materials 2023 10.1002/adhm.202301515
13. **Ionizable lipid nanoparticles for in vivo mRNA delivery to the placenta during pregnancy**
Kelsey L. Swingle, Hannah C. Safford, Hannah C. Geisler, Alex G. Hamilton, Ajay S. Thatte, Margaret M. Billingsley, **Ryann A. Joseph**, Kaitlin Mrksich, Marshall S. Padilla, Aditi A. Ghalsasi, Mohamad-Gabriel Alameh, Drew Weissman, Michael J. Mitchell
Journal of the American Chemical Society 2023 10.1021/jacs.2c12893

PRESENTATIONS

1. **Comparing lipid nanoparticle mediated delivery of Cas9 mRNA and protein for cystic fibrosis CRISPR gene editing**
Ryann A. Joseph, Rebecca M. Haley, Adele S. Riccardi, Marshall S. Padilla, Michael J. Mitchell, **Oral presentation**
Biomedical Engineering Society Annual Meeting, Baltimore, MD (2024)
2. **Synthesis of Barcoded mRNA for High-Throughput Nucleic Acid Delivery Screening**
Ryann A. Joseph, Alex G. Hamilton, Michael J. Mitchell, **Poster presentation**
Center for Undergraduate Research and Fellowships Fall Research Expo, University of Pennsylvania (2022)

TEACHING AND MENTORSHIP EXPERIENCE

Bioengineering Laboratory Principles Teaching Assistant (BE2700) - University of Pennsylvania Jan 2025 - May 2025

- Led learning sessions for second year bioengineering students in introductory medical device development.

Mathematics Teaching Assistant (MATH2400) - University of Pennsylvania Aug 2022 - June 2025

- Led instruction and assisted in the education of students studying linear algebra and ordinary differential equations

ACADEMIC EXTRACURRICULARS

Advancing Women in Engineering (AWE) Board - University of Pennsylvania | Board Member Mar 2024 - May 2025

- Led yearlong integration of incoming women in engineering to the university's campus and courses

Theta Tau Tau Gamma Professional Fraternity - University of Pennsylvania | Scribe Nov 2022 - May 2025

Biomedical Engineering Society (BMES) - University of Pennsylvania | Internal Vice President Sep 2022 - May 2025

- Coordinated 10+ pre-professional and social events for 300+ bioengineering students.

Orientation Leader (PHINS) and Peer Advisor (SEAS) - University of Pennsylvania Jun 2022 - May 2025

- Aided incoming engineering students on navigating the transition to college and general advising

Society of Women Engineers (SWE) - University of Pennsylvania | Education Outreach Committee Sep 2021 - May 2025

- Designed outreach campaigns and initiatives to empower women engineers

LEADERSHIP AND EXTRACURRICULARS

- SEAS Senior Design Judge's Choice Award (2025) →
- Rose Undergraduate Research Award (2025) →
- Penn Engineering Exceptional Service Award (2025) →
- Mathematics Departmental Good Teaching Award (Fall 2024)
- Mathematics Departmental Good Teaching Award (Spring 2024)
- Advancing Women in Engineering Undergraduate Summer Research Award (2024)
- Jumpstart for Juniors Award (2024)
- Penn Undergraduate Research and Mentorship (PURM) Fellow (2022)

SKILLS AND INTERESTS

Technical: Java, Python, LaTeX, Microsoft (Word, Excel), SolidWorks

Wet Lab: Lab and molecular biology skills (cell culture, gel electrophoresis, PCR, IVT, dissection, CRISPR-Cas9, flow cytometry)

Languages: English, Spanish

Interests: Marching band, Spanish, Ohio State Football, Lacrosse