

# Catherine A. Fromen

Assistant Professor of Chemical and Biomolecular Engineering  
University of Delaware • 150 Academy Street, 209 Colburn Laboratory Newark, DE 19716  
cfromen@udel.edu • sites.udel.edu/cfromen/

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## EDUCATION

### **Ph.D. Chemical Engineering**

Advisor: Joseph M. DeSimone

Dissertation: Monodisperse, uniformly-shaped particles for controlled respiratory vaccine delivery

**North Carolina State University, July 2014**

### **B.S. Chemical Engineering**

**University of Rochester, May 2009**

## PROFESSIONAL HISTORY

### **Assistant Professor**

Department of Chemical and Biomolecular Engineering

Department of Biological Sciences

**University of Delaware, Newark DE**

Fall 2017-Present

Fall 2022-Present

### **Affiliated Faculty Member**

Sociotechnical Systems Center (SSC)

Center for Biomufacturing Science and Technology (CBST)

Center for Research in Soft Matter and Polymers (CRiSP)

Chemistry-Biology Interface (CBI) NIH T-32 Program

**University of Delaware, Newark DE**

Summer 2020-Present

Winter 2020-Present

Spring 2019-Present

Spring 2018-Present

### **University of Michigan's President's Postdoctoral Fellow**

Department of Chemical Engineering

**University of Michigan, Ann Arbor MI**

Fall 2014-Summer 2017

## CURRENT RESEARCH

My research group designs therapeutic pulmonary aerosols and advanced lung models by applying engineering fundamentals, biomaterials, innovative tools, advanced transport understanding, and current mucosal immunology. Main research thrusts include:

- Using nano- and microparticles to probe lung innate immune function in cancer, fibrosis, and infection
- Engineering bioactive particles for controlled pulmonary stimulation, vaccination, and anti-viral action
- Leveraging 3D printing, biomaterials, & computational fluid dynamics to advance transport understanding and develop new *in vitro* tools for pulmonary drug delivery testing and personalized inhaled medicine

## AWARDS AND HONORS

- NSF CAREER Award Recipient January 2023
- *Biomaterials Science* Emerging Investigator September 2022
- AIChE DVS Outstanding Faculty Award April 2022
- NIH NIGMS R35 Early Stage Investigator MIRA Recipient June 2021
- Univ Delaware Honors College 2021 Excellence in Mentoring Award May 2021
- *AIChE Journal* Futures Investigator 2021
- *Journal of Materials Chemistry B* Emerging Investigator 2021
- AIChE 35 Under 35 (Bioengineering) September 2020
- ASEE Chemical Engineering Division Young Faculty Mentoring and Travel Grant April 2020
- PhRMA Foundation Pharmaceuticals 2020 Research Starter Grant Award February 2020
- *Polymer Chemistry* Emerging Investigator 2020
- Invited Participant to National Academy of Engineering's 2019 US Frontiers of Engineering Symposium, Charleston, SC September 2019
- Inaugural Early Career Board Member *ACS Biomater Sci Eng* Spring 2018
- Johnson and Johnson WiSTEM2D Scholar Finalist April 2018
- Univ Michigan Outstanding Postdoctoral Fellow Award August 2016
- Univ Michigan President's Postdoctoral Fellow, University of Michigan, MI 2014-2017
- Travel Award Recipient to attend National Academy of Science's Committee on Key Challenge Areas for Convergence and Health Workshop, Washington DC September 2013
- NextProf Workshop Selected Participant, University of Michigan, MI September 2013

- Mentored Teaching Award, North Carolina State University Spring 2013
- Shelby A. Miller Prize in Chemical Engineering Design, University of Rochester 2009
- Eisenberg Research Fellowship, University of Rochester 2008
- Rush Rhees Scholarship Recipient for Academic Excellence, University of Rochester 2005-2009

## **PUBLICATIONS**

Citations from Google Scholar Profile: (Last updated 1/12/2023) H-index: 18; Total citations: 1077  
<https://scholar.google.com/citations?user=YOiSE3YAAAAJ&hl=en> ORCID iD 0000-0002-7528-0997

\*co-first authors, Corresponding author, #co-corresponding authors, *undergraduate authors*

### **Peer-Reviewed Publications** (*pending submissions listed at bottom*)

1. Stillman, Z., Decker, G.E., Dworzak, M.R., Bloch, E.D., **Fromen, C.A.**, Aluminum-Based Metal-Organic Framework Nanoparticles as Pulmonary Vaccine Adjuvants. *J Nanobiotechnology* (2023) DOI: 10.1186/s12951-023-01782-w. [[Journal Impact Factor: 11.51, Citations 0](#)].
2. Sudduth, E.R., Kolewe, E.L., Graf, J., Yu, Y., *Somma, J.*, **Fromen, C.A.**, Nebulization of Model Hydrogel Nanoparticles to Macrophages at the Air-Liquid Interface. *Frontiers in Chemical Engineering* (2023) 4, DOI: 10.3389/fceng.2022.1086031. [[Journal Impact Factor: n/a, Citations 0](#)].
3. Bomb, K.,\* LeValley, P.J.,\* Woodward, I.R., Cassel, S.E., Yun, Z., Sutherland, B., Bhattacharjee, A., Steen, J., Kurdzo, E., McCoskey, J., Burris, D., Levine, K., Carbrello, C., Lenhoff, A.M., **Fromen, C.A.**,# Kloxin, A.M.# Cell therapy biomanufacturing: uniting biomaterial and flow-based membrane technologies for production of engineered T-cells, *Advanced Materials Technologies* (2022) DOI: 10.1002/admt.202201155. [[Journal Impact Factor: 8.9, Citations 0](#)].
4. Kolewe, E.L., *Padhye, S.*, Woodward, I.R., Wee, J., Rahman, T., Feng, Y., Briddell, J.W., **Fromen, C.A.**, Spatial aerosol deposition correlated to anatomic feature development in 6-year-old upper airway computational models. *Comput Biol Med* (2022). DOI: 10.1016/j.combiomed.2022.106058. [[Journal Impact Factor: 6.7, Citations 0](#)].
5. Hayati, H., Feng, Y., Chen, X., Kolewe, E.L., **Fromen, C.A.**, Prediction of Transport, Deposition, and Resultant Immune Response of Nasal Spray Vaccine Droplets using a CFPD-HCD Model in a 6-Year-Old Upper Airway Geometry to Potentially Prevent COVID-19. *Experimental and Computational Multiphase Flow* (2022). *In press*.10.1101/2022.11.08.515673 [[Journal Impact Factor: 1.2, Citations 0](#)].
6. Bomb, K., Pradhan, L., *Qi, Z.*, Jarai, B.M., Bhattacharjee, A., Burris, D., Kloxin, A.M.,# **Fromen, C.A.**,# Destructive fibrotic teamwork: how both microenvironment stiffness and profibrotic Interleukin 13 impair alveolar macrophage phenotype and function. *Biomaterials Science* (2022). DOI: 10.1039/D2BM00828A *Invited for 2022 Emerging Investigators Series*. [[Journal Impact Factor: 7.6, Citations 0](#)].
7. Jarai, B.M., **Fromen, C.A.** Nanoparticle Internalization Promotes the Survival of Primary Macrophages. *Advanced NanoBiomed Research* (2022) 2:5, 2100127. DOI: 10.1002/anbr.202100127 [[Journal Impact Factor: n/a, Citations 5](#)].
8. Woodward, I.R., **Fromen, C.A.** Scalable, process-oriented beam lattices: generation, characterization, and compensation for open cellular structures. *Additive Manufacturing* (2021) 48A, 102386 DOI: 10.1016/j.addma.2021.102386 [[Journal Impact Factor: 11.6, Citations 9](#)].
9. Roh, E, **Fromen, C.A.**,# Sullivan, M.O.# Inhalable mRNA vaccines for respiratory diseases: A roadmap. *Current Opinion in Biotechnology* (2022) 74, 104-109. DOI: 10.1016/j.copbio.2021.10.017 [[Journal Impact Factor: 9.7, Citations 1](#)].
10. Woodward, I.R., *Attia, L.M.*, *Patel, P.* **Fromen, C.A.** Scalable 3D Printed Lattices for Pressure Control in Fluid Applications. *AIChE J* (2021) 67:12 e17452 DOI: 10.1002/aic.17452. *Invited for 2021 Futures Series*. [[Journal Impact Factor: 4.2, Citations 11](#)].
11. Jarai, B.M., Stillman, Z., **Fromen, C.A.** Hydrogel Nanoparticle Degradation Influences the Activation and Survival of Primary Macrophages. *J Mat Chem B* 9 (2021) 7246-7257. 10.1039/D1TB00982F *Invited for 2021 Emerging Investigators Themed Issue*. [[Journal Impact Factor: 7.5, Citations 3](#)].

12. Jarai, B.M., Stillman, Z.S., Bomb, K., Kloxin, A.M., **Fromen, C.A.** Biomaterials-Based Opportunities to Engineer the Pulmonary Host Immune Response in COVID-19. *ACS Biomater Sci & Eng* 7:5 (2021) 1742–1764. DOI: 10.1021/acsbiomaterials.0c01287. *Selected as ACS Editors' Choice feature article.* [Journal Impact Factor: 5.4, Citations 11].
  13. Kolewe, E.L., Stillman, Z.S., Woodward, I.R., **Fromen, C.A.**, Check the Gap: Facemask Performance and Exhaled Aerosol Distributions Around the Wearer. *PLOS ONE* (2020). DOI: 10.1371/journal.pone.0243885 [Journal Impact Factor: 3.7, Citations 14].
  14. Jarai, B.M.\*, Stillman, Z.\*, Attia, L., Decker, G.E., Bloch, E.D., **Fromen, C.A.**, Evaluating UiO-66 Metal-Organic Framework (MOF) Nanoparticles as Acid-Sensitive Carriers for Pulmonary Drug Delivery Applications. *ACS Appl Mater Interfaces* 12:35 (2020) 38989-39004. DOI: 10.1021/acsami.0c10900 [Journal Impact Factor: 10.4, Citations 63].
  15. Peterman, E.L., Kolewe, E. L., **Fromen, C.A.**, Evaluating Regional Pulmonary Deposition Using Patient-Specific 3D Printed Lung Models. *JOVE Bioengineering* (2020) 165, e61706. DOI:10.3791/61706 [Journal Impact Factor: 1.4, Citations 1].
  16. Kolewe, E.L., Feng, Y., **Fromen, C.A.**, Realizing Lobe-Specific Aerosol Targeting in a 3D Printed *In Vitro* Lung Model. *J Aerosol Med Pulm D* 33:0 (2020) 1-15. DOI: 10.1089/jamp.2019.1564. [Journal Impact Factor: 3.4, Citations 13] *Selected as a Rosalind Franklin Society Award.*
  17. Shirazi, J., Donzanti, M.J., Nelson, K.M., Zurakowski, R., **Fromen, C.A.**, Gleghorn, J.P., Significant unresolved questions and opportunities for bioengineering in understanding and treating COVID-19 disease progression. *Cell Mol Bioeng* 13 (2020) 259-284. DOI: 10.1007/s12195-020-00637-w. [Journal Impact Factor: 2.4, Citations 10].
  18. Briddell, J.W., Vandjelovic, N.D., **Fromen, C.A.**, Peterman, E.L., Reilly, J.S., Geometric model to predict improvement after lingual frenulectomy for ankyloglossia. *Int J Pediatr Otorhinolaryngol* 134 (2020) 110063. DOI: 10.1016/j.ijporl.2020.110063. [Journal Impact Factor: 1.2, Citations 1].
  19. Zhao, J., Feng, Y., **Fromen, C.A.**, Glottis Motion Effects on Inhaled Particle Transport and Deposition in a Subject-Specific Human Mouth-to-Trachea Model: An in silico Study. *Comput Biol Med* 116 (2020) 103532. DOI: 10.1016/j.combiomed.2019.103532 [Journal Impact Factor: 6.7, Citations 26].
  20. Stillman, Z.S., Jarai, B.M., Raman, N., Patel, P., **Fromen, C.A.**, Degradation Profiles of Poly(ethylene glycol) diacrylate (PEGDA)-based hydrogel nanoparticles. *Polym Chem* 11:2 (2020) 568-580. *Invited for 2020 Emerging Investigators Collection.* [Journal Impact Factor: 5.4, Citations 30].
  21. Decker, G.E.,\* Stillman, Z.S.,\* Attia, L., **Fromen, C.A.**,# Bloch, E.,# Controlling Size, Defectiveness, and Fluorescence in Nanoparticle UiO-66 Through Water and ligand modulation. *Chem Mater* 31:13 (2019) 4831-4839. \*co-first authors, #co-corresponding authors [Journal Impact Factor: 10.5, Citations 28].
- Work Prior to University of Delaware--**
22. Fish, M.B., Braunreuther, M., Banka, A.L., **Fromen, C.A.**, Kelley, W.J., Lee, J., Adili, R., Holinstat, M., Eniola-Adefeso, O. Deformable Microparticles as Carriers for Nanoparticles: A Trojan Horse Approach to Vascular-Targeted Drug Delivery. *Scientific Reports* (2021) 7:17 eabe0143 [Journal Impact Factor: 5.0, Citations 15].
  23. Kelley, W.J., Onyskiw, P. **Fromen, C.A.**, Eniola-Adefeso, O., Model Particulate Drug Carriers Modulate Leukocyte Adhesion in Human Blood Flows. *ACS Biomater Sci Eng* 5:12 (2019) 6530-6540. [Journal Impact Factor: 5.4, Citations 9].
  24. Kelley, W.J., **Fromen, C.A.**, Lopez-Cazares, G., Eniola-Adefeso, O., PEGylation of model drug carriers enhances phagocytosis by primary human neutrophils. *Acta Biomaterialia* 79 (2018) 283-293. [Journal Impact Factor: 10.6, Citations 54].
  25. **Fromen, C.A.**, Kelley, W.J., Fish, M.B., Adili, R., Noble, J., Hoenerhoff, M.J., Holinstat, M., Eniola-Adefeso, O., Neutrophil-Particle Interactions in Blood Circulation Drive Particle Clearance and Alter Neutrophil Responses in Acute Inflammation. *ACS Nano* 11:11 (2017) 10797-10807. [Journal Impact

Factor: 18.0 Citations 64].

26. Noble, J., Zimmerman, A., **Fromen, C.A.**, Potent Immune Stimulation from Nanoparticle Carriers Relies on the Interplay of Adjuvant Surface Density and Adjuvant Mass Distribution. *ACS Biomater Sci Eng* 3:4 (2017) 560-571. [Journal Impact Factor: 5.4, Citations 8].
27. Fish, M.B., **Fromen, C.A.**, Lopez-Cazares, G., *Golinski, A.W.*, Scott, T.F., Adili, R., Holinstat, M., *Eniola-Adefeso, O.*, Exploring Deformable Particles in Vascular-Targeted Drug Delivery: Softer is Only Sometimes Better. *Biomaterials* 124 (2017) 169-179. [Journal Impact Factor: 15.3, Citations 49].
28. Rahhal, T.B., **Fromen, C.A.**, Wilson, E.M., Kai, M.P., Shen, T.W., Luft, J.C., *DeSimone, J.M.*, Pulmonary Delivery of Butyrylcholinesterase as a Model Protein to the Lung. *Mol Pharmaceutics* 13:5 (2016) 1626-1635. [Journal Impact Factor: 5.4, Citations 19].
29. **Fromen, C.A.**, Rahhal, T.B., Robbins, G.R., Kai, M.P., Shen, T.W., Luft, J.C., *DeSimone, J.M.*, Nanoparticle Surface Charge Impacts Distribution, Uptake and Lymph Node Trafficking by Pulmonary Antigen-Presenting Cells, *Nanomed. Nanotechnol, Biol, Med* 12:3 (2016) 677-687. **Featured Cover Article.** [Journal Impact Factor: 6.5, Citations 128].
30. **Fromen, C.A.**, Fish, M.B., Zimmerman, A., Adili, R. Holinstat, M., *Eniola-Adefeso, O.*, Evaluation of Receptor-Ligand Mechanisms of Dual-Targeted Particles to an Inflamed Endothelium. *Bioeng Transl Med* 1 (2016) 103–115. [Journal Impact Factor: 7.1, Citations 29].
31. Kai, M.P., Brighton, H.E., **Fromen, C.A.**, Shen, T.W., Luft, J.C., Luft, Y.E., Keeler, A.W., Robbins, G.R., Ting, J.P.Y., Zamboni, W.C., Bear, J.E., *DeSimone, J.M.*, Tumor Presence Induces Global Immune Changes and Enhances Nanoparticle Clearance, *ACS Nano* 10:1 (2016) 861-870. [Journal Impact Factor: 18.0, Citations 57].
32. Shen, T.W.\*, **Fromen, C.A.\***, Kai, M.P., Luft, J.C., Rahhal, T.R., Robbins, G.R., *DeSimone, J.M.*, Distribution and Cellular Uptake of PEGylated Polymeric Particles in the Lung Towards Cell-Specific Targeted Delivery, *Pharm Res* 32 (2015) 3248-3260. \*co-first authors [Journal Impact Factor: 4.6, Citations 36].
33. Sobczynski, D.J., Fish, M.B., **Fromen, C.A.**, Carasco-Teja, M., Coleman, R.M., *Eniola-Adefeso, O.*, Drug Carrier Interactions in Blood: A Critical Aspect for High-Efficient Vascular-Targeted Drug Delivery Systems, *Therapeutic Delivery* 6:8 (2015) 915-934. [Journal Impact Factor: 2.5, Citations 13].
34. Fish, M.B., Thompson, A.J., **Fromen, C.A.**, *Eniola-Adefeso, O.*, Emergence and Utility of Non-Spherical Particles in Biomedicine, *Ind Eng Chem Fundam* 56:16 (2015) 4043-4059. [Journal Impact Factor: 3.7, Citations 53].
35. **Fromen, C.A.\***, Robbins, G.R.\*, Shen, T.W., Kai, M.P., Ting, J.P.Y., *DeSimone, J.M.*, Controlled Analysis of Nanoparticle Charge on Mucosal and Systemic Antibody Responses Following Pulmonary Immunization, *Proc Natl Acad Sci USA* 112 (2015) 488-493. \*co-first authors. [Journal Impact Factor: 12.8, Citations 129].
36. **Fromen, C.A.**, Shen, T.W., *Larus, A.E.*, Mack, P., Luft, J.C., Maynor, B.W., *DeSimone, J.M.*, Synthesis and Characterization of Monodisperse Uniformly Shaped Respirable Aerosols, *AIChE Journal* 59:9 (2013) 3184-3194. [Journal Impact Factor: 4.2, Citations 23].
37. Garcia A., Mack P., Williams, S., **Fromen, C.A.**, Shen, T.W., Pillai, J., Kuehl, P., Napier, M.E., *DeSimone, J.M.*, *Maynor, B.W.*, Microfabricated Engineered Particle Systems for Respiratory Drug Delivery and Other Pharmaceutical Applications, *Journal of Drug Delivery* (2011). [Journal Impact Factor: 2.3, Citations 76].
38. Wang, Y., Merkel, T.J., Chen, K.; **Fromen, C.A.**, Betts, D.E., *DeSimone, J.M.*, Generation of a Library of Particles Having Controlled Sizes and Shapes via the Mechanical Elongation of Master Templates, *Langmuir* 27 (2011) 524-528. [Journal Impact Factor: 4.3, Citations 49].
39. Cox, G.P., Marshall, K.L., Lambropoulos, J.C., *Leitch, M.*, **Fromen, C.A.**, *Jacobs, S.D.*, Modeling the Effects of Microencapsulation on the Electro-Optic Behavior of Polymer Cholesteric Liquid Crystal Flakes,

#### Submitted Manuscripts and Preprint Articles

40. Sudduth, E., Trautmann-Rodriguez, M., Bomb, K., Gill, N., **Fromen, C.A.**, Aerosol Pulmonary Immune Engineering. *Submitted*
41. Jarai, B.M., Bomb, K., **Fromen, C.A.**, Nanoparticle Pre-treatment for Enhancing the Survival and Activation of Pulmonary Macrophage Transplant Therapy. *Submitted*
42. *Bartlett, B.A.*, Feng, Y., **Fromen, C.A.**, *Ford Versypt, A.N.* Computational Modeling of Aerosol Particle Transport through Lung Mucosa. *Posted to bioRxiv 10/19/21* <https://doi.org/10.1101/2021.10.18.464809>

#### Book Chapters

1. Jarai, B.M., Kolewe, E.L., Stillman, Z.S., *Raman, N.*, **Fromen, C.A.**, “Polymer Nanoparticles” in *Nanoparticles for Biomedical Applications: Fundamental Concepts, Biological Interactions, and Clinical Potential*, Chung, E.J., Leon, L., Rinaldi, C., Eds.; Elsevier (2020) 303-324.
2. Tang, C., Levit, S., Zeevi, M., Vasey, C., **Fromen, C.A.**, “Polymer Colloids Enable Medical Applications” in *Polymer Colloids*, Priestley, R.D., Prud’homme, R.K., Eds.; Royal Society of Chemistry (2020) 358.

#### --Work Prior to University of Delaware--

3. **Fromen, C.A.**, Dunn, S.S., DeSimone, J.M., “Biomedical Nanopreparations with Controlled Geometries” in *Handbook of Nanobiomedical Research: Fundamentals, Applications, and Recent Developments*, Torchillin, Ed.; World Scientific, Vol 4. (2014) 349-400.

#### Peer Reviewed Conference Proceedings

1. **Fromen, C.A.**, *Enszer, J.A.* “Putting Course Design Principles to Practice: Creation of an Elective on Vaccines and Immunoengineering.” Presented at the American Society for Engineering Education (ASEE) 2020 Annual Meeting (Virtual). June 2020. *Nominated for Best Paper: Chemical Engineering Division*

#### Additional Publications

1. **Fromen, C.A.**, Gleghorn, J.P. “Engineering Preclinical Tools and Therapeutics to Understand and Treat COVID-19” *Delaware Journal of Public Health* Vol 6: Issue 2A “From Cells to Society: Research in the time of COVID-19” (2020) 32-35.
2. **Fromen, C.A.**, Sample, W., Prasad, A., Buckley, J.M., “The HensNest: Mass Manufacturing a General Use Face Mask Here in Delaware” *Delaware Journal of Public Health* Vol 6: Issue 2B “From Cells to Society: Research in the time of COVID-19” (2020) 36-38.

#### --Work Prior to University of Delaware--

3. Robbins, G.R., **Fromen, C.A.**, Rahhal, T.B., Luft, J.C., Wang, A.Z., Pecot, C.V., DeSimone, J.M., “Non-Intravenous Routes of Delivery: Aerosol Therapy for Cancer Management” in *NCI Alliance for Nanotechnology in Cancer: Cancer Nanotechnology Plan 2015*. Section I: Emerging Strategies in Cancer Nanotechnology (2015) 39-43.
4. Petrosko, S.A., **Fromen, C.A.**, Auyeung, E., DeSimone, J.M., Mirkin, C.A., Nanotechnology: an Enduring Bridge Between Engineering and Medicine, *National Academy of Engineering, The Bridge* (2013) 7-15.

#### Patents

1. *Patent Pending*: **Fromen, C.A.**, Woodward, I.R., A Modular Approximation for Whole-Lung Volume Spatial Deposition Measurements. U.S. Patent Application Serial No.: 63/278,131. Submitted Nov 9, 2022.
2. *Patent Pending*: Gleghorn, J.P., Nelson, K., **Fromen, C.A.**, A Microparticle To Sequester SARS-CoV-2 In The Upper Airway. U.S. Provisional Application Serial No.: 63/061,862. Submitted Aug 6, 2021.
3. *Provisional (not converted)*: **Fromen, C.A.**, *Peterman, E.L.*, Kolewe, E.L., Endotracheal Tube Attachments for Inhalable Targeted Drug Delivery. U.S. Provisional Application Serial No.: 62/905,517. Submitted Sept 25, 2019.

#### --Work Prior to University of Delaware--

4. Cox, G. P., **Fromen, C. A.**, Marshall, K. L., Jacobs, S. D., PCLC Flake-based Apparatus and Method. U.S.

## **PRESENTATIONS**

Presenting author underlined, *undergraduate authors italicized*, **C.A.F in bold**

### **Invited Conference Presentations**

1. **Fromen, C.A.**, “Total Inhalable Deposition in an Actuated Lung Model” 2022 World Congress for Biomechanics. Biofluid and Transport 2: Experimental track, Airway Flows and Lung Transport Session. Taipei, Taiwan, July 10-14, 2022. *Invited Speaker.*
2. **Fromen, C.A.**, “Untangling the Pro-fibrotic loop in Pulmonary Fibrosis: Synergy between substrate stiffness and soluble factors promotes alternative activation of macrophages” 2022 Nanotechnology in Medicine III: Enabling Next Generation Therapies. Calabria, Italy. May 15-20 2022. *Invited Speaker*
3. **Fromen, C.A.**, “Nanoparticle Physiochemical Design Features to Modulate Pulmonary Innate Immune Cell Response” 2021 AIChE Annual Meeting. Bionanotechnology Plenary. Boston, MA, November 7-19, 2021. *Invited Plenary Speaker*
4. **Fromen, C.A.**, Woodward, I.R., Attia, L., Patel, P. “Scalable 3D Printed Lattices for Pressure Control in Fluid Applications” 2021 AIChE Annual Meeting. *AIChE J Futures: New Directions in Chemical Engineering* Session. Boston, MA, November 7-19, 2021. *Invited Speaker*
5. **Fromen, C.A.**, “Prologue: Predictive or Non-Predictive, What Works for Special Delivery Routes?” (recorded) and “Remaining Needs for Experimental Models in Pulmonary Delivery” (live) AAPS PharmSci 360 Annual Meeting. Clinical Pharmacology – Chemical Track. Philadelphia, PA. Oct 17-20, 2021. *Invited Prologue Speaker*
6. Stillman, Z., Jarai, B., Decker, G., Attia, L., Bloch, E., **Fromen, C.A.**, “Tunable Metal-Organic Framework (MOF) Nanoparticles as Inhaled Drug Delivery Vehicles” 2021 Middle Atlantic Regional Meeting (MARM). Virtual - Newark, Delaware, June 9-11, 2021. *Invited Speaker*
7. **Fromen, C.A.**, “Pulmonary Immune Engineering in the Time of COVID-19” 14th Northeast Complex Fluids and Soft Matter (NCS 14) Workshop. Virtual. January 15, 2021. *Invited Speaker.*
8. **Fromen, C.A.**, “Designer nanomedicines: formulation considerations for the next generation of inhalable therapeutics” 2020 Frontiers in Particle Science and Technology Forum. AIChE Spring Meeting. Houston, TX. March 30 April 1, 2020. *Invited Speaker. \*conference postponed due to SARS\_COV2. Delivered virtually August 18, 2020.*
9. **Fromen, C.A.**, “Leveraging molecular order of highly porous metal organic framework (MOF) nanoparticles for pulmonary drug delivery” International Conference on Bio-Nano Innovation (ICBNI 2020) International Conference on Nanoscience and Nanotechnology (ICONN). Brisbane, Australia. February 9 – 12, 2020. *Invited Speaker.*
10. **Fromen, C.A.**, “Tuning physiochemical properties of nanoparticles for pulmonary immune engineering applications” Frontiers at the Chemistry & Biology Interface Symposium (FCBIS). National Cancer Institute’s Chemical Biology Laboratory. Bethesda, MD. May 3, 2019. *Invited Speaker.*
11. **Fromen, C.A.**, “Engineering Particle-Lung Interactions to Improve Pulmonary Therapeutics” Northeast Bioengineering Conference (NEBEC) Immunoengineering Session. Drexel University. Philadelphia, PA. March 30, 2018. *Invited Speaker & Panelist.*

### **Invited Seminars and Lectures**

1. **Fromen, C.A.**, “Breathe it in: Engineering Approaches Towards Diversifying Inhalable Therapeutics.” Department of Chemical and Biological Engineering, Princeton University. Princeton, NJ. November 8, 2022. *Invited Department Seminar Speaker.*
2. **Fromen, C.A.**, “Breathe it in: Engineering Approaches Towards Diversifying Inhalable Therapeutics.” Department of Bioengineering, Northeastern University. Boston, MA. October 5, 2022. *Invited Department*

*Seminar Speaker.*

3. **Fromen, C.A.**, “Breathe it in: Engineering Approaches Towards Diversifying Inhalable Therapeutics” Department of Pharmaceutics, Virginia Commonwealth University. Richmond, VA. November 12, 2021. *Invited Department Seminar Speaker.*
4. **Fromen, C.A.**, “Applications of Chemical Engineering in Designing Inhalable Therapeutics” American Institute for Chemical Engineers – Delaware Valley Section – Professional Development Hour. November 30, 2021. *Invited PDH Speaker.*
5. **Fromen, C.A.**, “Breathe it in: Engineering Approaches to Realize Pulmonary Vaccines” Department of Chemical Engineering, Stanford University. Palo Alto, CA. October 11, 2021. *Invited Department Seminar Speaker.*
6. **Fromen, C.A.**, “Breathe it in: Engineering Approaches to Realize Pulmonary Vaccines” Chemical Engineering Program, Arizona State University. Tempe, AZ. September 20, 2021. *Invited Department Seminar Speaker.*
7. **Fromen, C.A.**, “Regulating Innate Immune Cell Response and Longevity through Nanoparticle Physiochemical Design Features” Department of Biological Sciences, University of Delaware. Newark, DE. September 27, 2021. *Invited Department Seminar Speaker.*
8. **Fromen, C.A.**, “Episode COVID19: The Immune System Strikes Back” Department of Chemical and Biomolecular Engineering, University of Delaware. Newark, DE. May 15, 2020. *Invited Department Webinar Speaker.*
9. **Fromen, C.A.**, “Breathe it in: Engineering Approaches to Improve Inhalable Medicines” Department of Chemical Engineering, University of Iowa. Iowa City, IA. April 9, 2020. *Invited Department Seminar Speaker. \* postponed due to SARS\_COV2. ~Virtual visit October 8, 2020~*
10. **Fromen, C.A.**, “Breathe it in: Engineering Approaches to Improve Inhalable Medicines” Department of Chemical Engineering, Carnegie Mellon University. Pittsburgh, PA. March 19, 2020. *Invited Department Seminar Speaker. \* postponed due to SARS\_COV2. ~Virtual visit October 13, 2020~*
11. **Fromen, C.A.**, “Engineering Approaches to Improve Inhalable Medicines” Junior Investigators Network (JIN) Call, DE INBRE. March 19, 2020. *Invited Speaker.*
12. **Fromen, C.A.**, “Pulmonary aerosol delivery of nanomedicines: regional targeting, platform design, and innate cell regulation” Center for Targeted Therapeutics and Translational Nanomedicine (CT3N). University of Pennsylvania. Philadelphia, PA. March 11, 2020. *Invited Work In Progress Seminar Speaker. \* postponed due to SARS\_COV2*
13. **Fromen, C.A.**, “Using Engineering Approaches to Improve Inhalable Respiratory Therapeutics” Oklahoma State University School of Chemical Engineering, Graduate Seminar Series. Stillwater, OK. October 29, 2019. *Invited Department Seminar Speaker.*
14. **Bridgell, J.** and **Fromen, C.A.**, “3D Printing of Pediatric Patient Airways for improved Aerosol Therapeutics” Nemours Biomedical Lunch and Learn Series, DuPont Experimental Station, Wilmington, DE. February 1, 2019. *Invited Co-Speaker.*
15. **Fromen, C.A.**, “Engineering Particle-Cell Interactions in the Lung” University of Missouri Chemical Engineering Department. Columbia, MO. April 17, 2018. *Invited Department Seminar Speaker.*
16. **Fromen, C.A.**, ““Giving Nanoparticles Directions: Surface Chemistry Modifications Guide the Fate of Nanoparticles in the Body” University of Delaware CBI Seminar Series. Newark, DE. March 14, 2018. *Invited Seminar Speaker.*

**Conference Oral Presentations**

1. **Fromen, C.A.**, Construction of a Full Airway Volume “Total Inhalable Deposition in an Actuated Lung” (TIDAL) Model for Approximating Spatial Deposition Under Breathing Profiles. Drug Delivery to the Lungs (DDL) 2022. Edinburgh, Scotland. December 7-9, 2022. *Selected Podium Talk.*

2. Woodward, I.R., **Fromen, C.A.**, Understanding multiphase behavior of additively manufactured lattices: Developing *in vitro* tools for personalized inhalable medicine. AIChE Annual Meeting, Phoenix, AZ, November 13-18, 2022.
3. Woodward, I.R., **Fromen, C.A.**, Directionally dependent fluid behavior from uniform periodic structures: Influence of design and additive process parameters. AIChE Annual Meeting, Phoenix, AZ, November 13-18, 2022.
4. Kolewe, E.L., **Fromen, C.A.**, Computational Fluid Particle Dynamics Illuminates Developmental Anatomical Feature Influence on Aerosol Deposition Patterns in 6-Year-Old Upper Airway CT-Scan Models. AIChE Annual Meeting, Phoenix, AZ, November 13-18, 2022.
5. Bomb, K., Kloxin, A.M., **Fromen, C.A.**, Combining Tunable Biomaterials and Flow-Based Membrane Technologies for Improved Biomanufacturing of T Cell Therapies. AIChE Annual Meeting, Phoenix, AZ, November 13-18, 2022. *Third place Graduate Student Award in Biomaterials*
6. Bomb, K., Kloxin, A.M., **Fromen, C.A.**, Probing Synergistic Effect of Substrate Stiffness and Profibrotic Soluble Cues on Macrophage Response. BMES Annual Meeting. San Antonio, TX, October 12-15, 2022.
7. **Fromen, C.A.**, Inhalable Aluminum-based Metal Organic Framework Nanoparticles as Humoral Pulmonary Adjuvants. BMES Annual Meeting. San Antonio, TX, October 12-15, 2022.
8. **Fromen, C.A.**, Scalable 3D Printed Lattices for Control in Fluid and Aerosol Applications. POLY: E.V. Murphree Award in Industrial and Engineering Chemistry in Honor of Joseph Desimone. ACS Spring 2022, San Diego, CA, March 23, 2022.
9. Kolewe, E.L., Padhye, S., Woodward, I.R., Briddel, J., Feng, Y., **Fromen, C.A.**, Spatial deposition and larynx developmental analysis of 6 year-olds through Computational Fluid Particle Dynamics. Society for Computational Fluid Dynamics of the Nose & Airway (SCONA) Virtual Meeting, January 28, 2022.
10. Woodward, I.R., Attia, L., Patel, P., **Fromen, C.A.**, Design and Processing of Open Lattice Structures for Tunable Fluid Phenomena. AIChE Annual Meeting, Boston, MA, November 7-19, 2021.
11. Jarai, B.M., **Fromen, C.A.**, Internalization of Nanoparticles Enhances the Survival of Primary Macrophages. Northeast Regional IDEa Conference (NERIC), Lightning Talk- Technology Section. Virtual, August 2021. *First place Lightning Talk Award.*
12. **Fromen, C.A.**, Nanoparticle-induced Regulation of Primary Macrophage Survival. CRS Annual Meeting, Virtual, July 25-29, 2021.
13. LeValley, P.J., Bomb, K., Sutherland, B., Steen, J., Kurdzo, E., Du, Z., Carbrello, C., Lenhoff, A.M., **Fromen, C.A.**, Kloxin, A. M., Combining flow-based membrane and tunable biomaterial technologies to improve the scalability and efficiency of biomanufacturing approaches for cell therapies. ACS Annual Meeting, BIOT Division, Virtual, August 2021.
14. Kolewe, E.L., **Fromen, C.A.**, Lobe-Specific Aerosol Targeting in a 3D Printed Lung Model. AIChE Annual Conference, Medical Devices Session, Virtual, November 15-20, 2020.
15. Kolewe, E.L., **Fromen, C.A.**, Aerosol Therapeutic Delivery in 3D Printed Pediatric Airway Replicas. AIChE Annual Conference, Multi-scale Transport Considerations for Drug Delivery Session, Virtual, November 15-20, 2020.
16. Bomb, K., **Fromen, C.A.**, Kloxin, A.M, Utilizing Variable Substrate Stiffness to Investigate Macrophage Response in Healthy and Fibrotic Pulmonary Microenvironment. AIChE Annual Conference, Hydrogel Biomaterials: Emerging Applications Session, Virtual, November 15-20, 2020.
17. Jarai, B.M., **Fromen, C.A.**, Inert Particles for Enhancing the Survival of Primary Macrophages. AIChE Annual Conference, Bionanotechnology Graduate Student Award Session, Virtual, November 15-20, 2020. *Second Place Graduate Student Award.*
18. Jarai, B.M., **Fromen, C.A.**, Inert Particles for Enhancing the Survival of Primary Macrophage. Immune Modulation & Engineering Symposium. Virtual (Drexel). November 11-13, 2020.



19. Stillman, Z.S., Jarai, B.M., Attia, L., Decker, G.E., Bloch, E.D., **Fromen, C.A.**, Triggered Intracellular Release from Ph-sensitive Metal-organic Framework Nanoparticles For Pulmonary Drug Delivery. CRS 2020 Virtual Annual Meeting. June 29-July 2, 2020. On-Demand Talk.
  20. **Fromen, C.A.**, Enszer, J.A. "Putting Course Design Principles to Practice: Creation of an Elective on Vaccines and Immunoengineering." ASEE 2020 Virtual Annual Meeting. June 22-26, 2020.
  21. Stillman, Z.S., Decker, G.E., Attia, L., Bloch, E.D., **Fromen, C.A.**, Understanding particle size measurements of UiO-66 via defectiveness. ACS Annual Spring Meeting, INORG: Chemistry of Materials, Philadelphia, PA, March 26, 2020. \*conference canceled due to SARS\_COV2
  22. Jarai, B.M., Stillman, Z.S., Decker, G.E., Attia, L., Abbas, S., Bloch, E.D., **Fromen, C.A.**, Utilizing UiO-66 Metal-Organic Frameworks (MOFs) As Pulmonary Drug Delivery Vehicles. AIChE Annual Conference, Bionanotechnology for Drug Delivery, Orlando, FL, United States, November 2019.
  23. Kolewe, E.L., Feng, Y., **Fromen, C.A.**, Realizing Lobe-Specific Targeting of Aerosols in a 3D Printed Lung Model. BMES Annual Meeting, Modeling the Respiratory System and Drug Delivery, Philadelphia, PA, October 18, 2019.
  24. Zhao, J., Feng, Y., **Fromen, C.A.**, Hayati, H., The Impact of Glottis Abduction and Adduction on Particle Transport and Deposition in a Human Upper Airway Model. Third Aerosol Dosimetry Conference. Irvine, CA, October 2019.
  25. Decker, G.E., Stillman, Z.S., **Fromen, C.A.**, Bloch, E.D. Particle size and defect control in nanoparticulate UiO-66 via modulator-free synthetic conditions. 258th ACS National Meeting & Exposition, San Diego, CA, United States, August 25-29, 2019.
  26. Vandjelovic, N.D. (DO), Briddell, J.W. (MD), **Fromen, C.A.**, *Peterman, E.*, Johnston, D.R. (MD), Reilly, J.S. (MD), A geometric model to explain the beneficial impact of lingual frenotomy for ankyloglossia in breastfeeding women. Society for Ear, Nose, and Throat Advances in Children Annual Meeting. Houston, Texas, December 2018.
- Work Prior to University of Delaware--**
27. Fish, M.B., **Fromen, C.A.**, Scott, T.F., Adili, R., Holinstat, M., Eniola-Adefeso, O., Impact of Particle Modulus on Vascular-Targeted Drug Delivery In Vitro and In Vivo. Oral Presentation in Polymer Applications & Characterization in the Biomedical Industry. ACS 253rd National Meeting, San Francisco, CA, April 2017.
  28. *Noble, J.*, *Zimmerman, A.*, **Fromen, C.A.**, Toll-like Receptor (TLR)-functionalized nanoparticle adjuvant carriers toward optimized vaccine formulations and immune-modulators. Oral Presentation in Biomaterials Faculty Candidates session at AIChE Annual Conference, San Francisco, CA, November 2016.
  29. **Fromen, C.A.**, Fish, M.B., *Zimmerman, A.*, Adili, R., Holinstat, M., Eniola-Adefeso, O., Evaluation of Vascular Targeted Carriers Designed with Dual Ligand Strategies to Target an Inflamed Endothelium. Oral Presentation at Bionanotechnology session at AIChE Annual Conference, San Francisco, CA, November 2016. ***Session's Best Presentation.***
  30. **Fromen, C.A.**, Shen, T.W., Rahhal, T.B., Kai, M.P., Robbins, G.R., Luft, J.C., DeSimone, J.M., Particle Surface Properties of Pulmonary Drug Delivery Vehicles Impact their Distribution and Cellular Association. Oral presentation in Biomaterials for Drug Delivery session, AIChE Annual Conference, Salt Lake City, UT, November 2015.
  31. **Fromen, C.A.**, Robbins, G.R., Shen, T.W., Kai, M.P., Ting, J.P.Y., DeSimone, J.M., Surface Properties of Nanoparticle Vaccines for Potent Pulmonary Mucosal Immunity. Oral Presentation in Biomaterials for Immunological Applications Session. AIChE Annual Conference, Atlanta, GA, November 2014.
  32. **Fromen, C.A.**, DeSimone, J.M., Co-opting Moore's Law: Design of Shape-Specific Particulate-Based Vaccines and Therapeutics. Annual Chapel Hill Pharmaceutical Sciences Conference, Chapel Hill, NC, May 2014. ***Substitute Speaker for Plenary Lecture.***
  33. **Fromen, C.A.**, Robbins, G.R., Shen, T.W., Kai, M.P., Ting, J.P.Y., DeSimone, J.M., Nanoparticle Designs

for Pulmonary Vaccines. Annual Chapel Hill Pharmaceutical Sciences Conference, Chapel Hill, NC, May 2014. *Leaf Huang Research Award for Best Oral Presentation, Third Place.*

34. **Fromen, C.A.**, Pulmonary Delivery of PRINT Nanoparticles for Novel Vaccine Strategies. Council for Chemical Research Annual Meeting, Alexandria, VA, May 2014. *Invited Talk as Student Leader.*
35. **Fromen, C.A.**, Pulmonary Delivery of PRINT Therapeutics. NCSU Shoeborn Symposium, Raleigh, NC, February 2014. *Third Place Oral Presentation Winner.*
36. **Fromen, C.A.**, Mueller, S.N., Roberts, R.A., Shen, T.W., Robbins, G.R., Allen, I.C., Mooney, H.J., Luft, J.C., Ting, J.P.Y., DeSimone, J.M., Nanoparticle Design for Vaccine Delivery. Oral Presentation in Biomaterials Faculty Candidates Session. AIChE Annual Conference, San Francisco, CA, November 2013.
37. **Shen, T.W., Fromen, C.A.**, Roberts, R.A., Allen, I.C., Luft, J.C., Ting, J.P.Y., DeSimone, J.M., Tailoring Macrophage Uptake of Inhaled Particles for Pulmonary Delivery Applications. International Society for Aerosols in Medicine 2013, Chapel Hill, NC, April 2013. *First Place Student Award.*

#### Conference Poster Presentations

1. **Padhye, S.** Kolewe, E.L., Feng, Y., Briddell, J.W., **Fromen, C.A.**, Effects of Patient Age on Simulated Aerosol Particle Deposition in the Upper Airways of Pediatric Patients. AIChE Annual Meeting, Phoenix, AZ, November 13-18, 2022.
2. Jarai, B.M., Bomb, K., **Fromen, C.A.**, Nanoparticle-pretreatment to regulate pulmonary macrophage transplant survival and *in situ* phenotype. BMES Annual Meeting. San Antonio, TX, October 12-15, 2022.
3. Jarai, B.M., Bomb, K., **Fromen, C.A.**, Nanoparticle-induced Regulation of Pulmonary Macrophage Transplant Survival. 2022 Controlled Release Society Annual Meeting. Montreal, Canada, July 11-14, 2022.
4. **Bomb, K.**, Kloxin, A.M., **Fromen, C.A.**, Establishment of a mechanically and biochemically tunable culture platform to probe key factors in macrophage responses during the initiation and progression of fibrosis. 2022 SFBiomaterials Annual Meeting. Baltimore, MD, April 27-30, 2022.
5. **Woodward, I.R., Fromen, C.A.** Next-gen devices: Design, processing, and fluid behavior of scalable 3D printed lattices. 2021 Merck Emerging Talent Symposium. November 4, 2021. Virtual.
6. **Bomb, K.**, LeValley, P.J., Sutherland, B., Steen, J., Kurdzo, E., Du, Z., Carbrello, C., Kloss, C., Lenhoff, A.M., **Fromen, C.A.**, Kloxin, A.M. Combing flow-based membrane and tunable biomaterials technologies to improve the scalability and efficiency of biomanufacturing approaches for cell therapies. 2021 Merck Emerging Talent Symposium. November 4, 2021. Virtual.
7. **Kolewe, E.L.**, Feng, Y., Briddell, J., **Fromen, C.A.** Throat Deposition Variations with Pediatric Airway Development *In Silico*. ISAM Congress. Boise ID and virtual, May 22-26, 2021.
8. **Stillman, Z.S.**, Jarai, B.M., Decker, G.E., **Attia, L.**, Bloch, E.D., **Fromen, C.A.**, Utilizing Tunable, Acid-Degradable UiO-66 Metal-Organic Framework (MOF) Nanoparticles for Pulmonary Drug Delivery. ISAM Congress. Boise ID and virtual, May 22-26, 2021.
9. **Attia, L.**, **Fromen, C.A.**, Evaluation of UiO-66 Nanoparticles as Pulmonary Drug Delivery Vehicles. NCSU Future Leaders in Chemical Engineering Symposium. Raleigh, NC October 26, 2020.
10. **Peterman, E.L.**, **Fromen, C.A.**, Integrating Computational and *In Vitro* Modeling Techniques to Elucidate Mechanisms of Pulmonary Drug Delivery. NCSU Future Leaders in Chemical Engineering Symposium. Raleigh, NC October 26, 2020.
11. **Minahan, D.**, Donzati, M., **Fromen, C.A.**, Gleghorn, J.P. Tracking Nanoparticle Deposition And Dynamics In An Ex Vivo Neonatal Mouse Lung To Guide Therapeutic Nanoparticle Design. ATS International Conference, Philadelphia, PA, May 2020. *\*conference canceled due to SARS\_COV2*
12. **Kolewe, E.L.**, Briddell, J.W., **Fromen, C.A.** Aerosol Deposition Patterns in 3D Printed Pediatric Throat Replicas. ATS International Conference, Philadelphia, PA, May 2020. *\*conference canceled due to SARS\_COV2*

13. Kolewe, E.L., Feng, Y., **Fromen, C.A.** Assessment of Regional Aerosol Deposition in 3D Printed Lung Replicas. ATS International Conference, Philadelphia, PA, May 2020. *\*conference canceled due to SARS\_COV2*
14. Kolewe, E.L., *Peterman, E.L.*, Feng, Y., **Fromen, C.A.** Assessment Of Regional Aerosol Deposition In 3D Printed Lung Replicas. ATS International Conference, Philadelphia, PA, May 2020. *\*conference canceled due to SARS\_COV2*
15. Stillman, Z.S., Decker, G.E., *Attia, L.*, Bloch, E.D., **Fromen, C.A.**, Tuning Uio-66 Particle Size, Defectiveness, and Fluorescence Via Modulation of Water and Ligand Equivalents. AIChE Annual Conference, Orlando, FL, November 2019.
16. *Attia, L.*, Stillman, Z.S., Decker, Bloch, E.D., **Fromen, C.A.**, Evaluating the Fluid and Aerodynamic Properties of Uio-66 Nanoparticles. AIChE Annual Conference, Orlando, FL, United States, November 2019. Second Place Student Award - Materials Science and Engineering.
17. Raman, N., Stillman, Z.S., **Fromen, C.A.**, Modulation of Adjuvant Loading and Degradation Profiles of Biocompatible Polymeric Nanoparticles for Immune Stimulation. AIChE Annual Conference, Orlando, FL, United States, November 2019. First Place Student Award - Food, Pharmaceutical and Biotechnology.
18. *Peterman, E.L.*, Kolewe, E.L., **Fromen, C.A.**, Utilizing Endotracheal Tubes to Modulate Particle Deposition Profiles in a 3D-Printed Lung Model. AIChE Annual Conference, Orlando, FL, United States, November 2019.
19. *Lane, K.*, **Fromen, C.A.**, Ford Versypt, A.N., A Systems Biology Model of Myeloid-Derived Suppressor Cells and Cancer Immunotherapy. AIChE Annual Conference, Orlando, FL, United States, November 2019.
20. *Bartlett, B.*, Feng, Y., **Fromen, C.A.**, Ford Versypt, A.N., Computer Modeling of Aerosol Diffusion through Lung Mucosa. AIChE Annual Conference, Orlando, FL, United States, November 2019. Third Place Student Award - Computing, Simulation and Process Control.
21. *Peterman, E.L.*, Kolewe, E.L., **Fromen, C.A.**, Utilizing Endotracheal Tubes to Analyze and Manipulate Particle Deposition in a 3D-Printed Lung Model, BMES Annual Meeting, Philadelphia, PA, October 18, 2019.
22. Papoutsakis, E., **Fromen, C.A.**, Culture of Epithelial Cell Monolayers on 3D Printed Surfaces Towards Development of a Novel *In Vitro* Respiratory Deposition Tool, BMES Annual Meeting, Philadelphia, PA, October 18, 2019.
23. *Attia, L.*, Stillman, Z., Decker, J., Jarai, B.M., Bloch, E., **Fromen, C.A.**, Fluid and Aerodynamic Properties of UiO-66 Nanoparticles with Varying Defectiveness and Cargo-Loading, BMES Annual Meeting, Philadelphia, PA, October 18, 2019.
24. Raman, N., Stillman, Z.S., **Fromen, C.A.**, Modulation of Adjuvant Loading and Degradation Profiles of Biocompatible Polymeric Nanoparticles for Immune Stimulation, BMES Annual Meeting, Philadelphia, PA, October 18, 2019.
25. *Attia, L.*, Stillman, Z., Decker, J., Jarai, B.M., Bloch, E., **Fromen, C.A.**, Fluid and Aerodynamic Properties of UiO-66 Nanoparticles with Varying Defectiveness and Cargo-Loading, Biotechnology and Biomedical Career Fair Poster Reception, Newark, DE, October 2019. Third Place Student Award.
26. Kolewe, E.L., Feng, Y., Briddell, J., **Fromen, C.A.**, Realizing Localized Aerosol Targeting: Right and Left Lung Deposition. International Society of Aerosols in Medicine, Montreux, Switzerland, May 2019.
27. Zhao, J., Liu, L., **Fromen, C.A.**, Feng, Y. Predicting Transport and Deposition of Inhaled Microparticles in an Elastic Lung Model. BMES/FDA Frontiers in Medical Devices Conferences, College Park, MD, April 2019.
28. Abbas, S., Stillman, Z., Decker, J., *Attia, L.*, Bloch, E., **Fromen, C.A.**, Loading UIO-66 MOF with Fluorescent Molecules for Drug Delivery. Undergraduate Poster Session at AIChE Annual Conference,

Pittsburgh, PA, November 2018.

29. Attia, L., Stillman, Z., Abbas, S., Decker, J., Bloch, E., **Fromen, C.A.**, Evaluating Metal-Organic Frameworks as Pulmonary Drug Delivery Vehicles, Undergraduate Poster Session at AIChE Annual Conference, Pittsburgh, PA, November 2018.
30. **Fromen, C.A.**, Jarai, B., Stillman, Z., Noble, J., Zimmerman, A., Engineered Nanotherapeutics for Pulmonary Aerosol Delivery. ECI Nanotechnology in Medicine II, Albuferia, Portugal, June 2018.

**--Work Prior to University of Delaware--**

31. **Fromen, C.A.**, Engineering Intelligently Designed Nano- and Microparticles to Control Interactions with the Immune System. Poster Presentation at Meet the Faculty Candidate session at AIChE Annual Conference, San Francisco, CA, November 2016.
32. Fish, M.B., **Fromen, C.A.**, Scott, T.F., Adili, R., Holinstat, M., Eniola-Adefeso, O., Deformable Particles for Vascular-Targeted Drug Delivery: Softer is Not Always Better, Blue Green Seminar, East Lansing, October 2016. First Place Poster Winner.
33. **Fromen, C.A.**, Noble, J.N., Zimmerman, A., Particle Surface Properties Direct Cellular Immune Responses in the Lung. Engineering Conferences International- Nanotechnology: from Molecules to Humans, Herrnsstein, Austria, July 2016. Poster Presentation Winner.
34. Fish, M.B., **Fromen, C.A.**, Adili, R., Holinstat, M., Eniola-Adefeso, O., Experimental Evaluation of Receptor-Ligand Interactions of Dual-Targeted Particles to Inflamed Endothelium. Engineering Conferences International- Nanotechnology: from Molecules to Humans, Herrnsstein, Austria, July 2016.
35. Fish, M.B., **Fromen, C.A.**, Adili, R., Holinstat, M., Eniola-Adefeso, O., Evaluation of Ligand-Receptor Interactions of Dual-Targeted Particles to a Diseased Endothelium. UM Chemical Engineering Graduate Symposium, Ann Arbor, MI, May 2016.
36. **Fromen, C.A.**, Shen, T.W., Rahhal, T.B., Kai, M.P., Robbins, G.R., Luft, J.C., DeSimone, J.M., Evaluating the Role of Particle Surface Properties on their Distribution and Cellular Association Following Pulmonary Delivery. Poster presentation at Nano Drug Delivery Symposium (NanoDDS), Seattle, WA, September 2015.
37. **Fromen, C.A.**, Robbins, G.R., Rahhal, T.B., Kai, M.P., Shen, T.W., Luft, J.C., Ting, J.P.Y., DeSimone, J.M., The Role of Nanoparticle Surface Charge in the Generation of Mucosal and Systemic Antibody Responses Following Pulmonary Delivery. Poster Presentation at International Congress of Mucosal Immunology (ICMI), Berlin, Germany, July 2015.
38. Rahhal, T.B., **Fromen, C.A.**, Shen, T.W., Luft, J.C., DeSimone, J.M., Inhaled Particle Technology for Nerve Agent Inactivation. Poster Presentation at Translational Medicine Symposium, Chapel Hill, NC, April 2015. Third Place Poster Presentation Winner.
39. Shen, T.W., **Fromen, C.A.**, Kai, M.P., Roberts, R.A., Luft, J.C., Ting, J.P.Y., DeSimone, J.M., Distribution and clearance of PRINT particles in the lung. Annual Chapel Hill Pharmaceutical Sciences Conference, Chapel Hill, NC, May 2014. Leaf Huang Research Award for Best Poster Presentation, First Place.
40. **Fromen, C.A.**, Fabrication of Engineered, Monodisperse Particles for Respiratory Drug Delivery. Meet the Faculty Candidates Session. AIChE Annual Conference, San Francisco, CA, November 2013.
41. **Fromen, C.A.**, Shen, T.W., Mack, P., Garcia, A., Mitran, S., Napier, M.E., Maynor, B.W., DeSimone, J.M., Fabrication and Characterization of Engineered Particles for Respiratory Drug Delivery. North Carolina State University Graduate Research Symposium, Raleigh, NC, March 2012. **Department Representative.**
42. **Fromen, C.A.**, Shen, T.W., Mack, P., Garcia, A., Mitran, S., Napier, M.E., Maynor, B.W., DeSimone, J.M., Fabrication and Characterization of Engineered Particles for Respiratory Drug Delivery. Drug Delivery to the Lungs 22, Edinburgh, Scotland, December 2011.

43. Garcia, A., Mack, P., Tully, J., **Fromen, C.A.**, Shen, T.W., DeSimone, J.M., Maynor, B.W., Microfabricated, engineered particles for respiratory drug delivery of proteins. American Association of Pharmaceutical Scientists (AAPS) Inhalation and Nasal Technology Focus Group (INTFG) Workshop, Baltimore, MD, September 2011.
44. **Fromen, C.A.**, Shen, T., Forman, N., Stiles, C., *Larus, A.*, Mitran, S., Napier, M., DeSimone, J., Characterizing shaped PRINT aerosols for pulmonary delivery. International Fine Particle Research Institution General Meeting, Chapel Hill, NC, June 2011 AND UNC-CH Materials Research Society Chapter's (MRS) Graduate Poster Symposium, Chapel Hill, NC, August 2011. *Award for Second Place.*
45. **Fromen, C.A.**, Pillai, J., Forman, N., Shen, T., Mitran, S., Napier, M., DeSimone, J. M., Engineered PRINT aerosols for pulmonary delivery. NCSU Shoeborn Symposium, Raleigh, NC, 2011. *Award for Second Place.*
46. **Fromen, C.A.**, Cox, G. P., Marshall, K. L., Jacobs, S. D., Microencapsulation of doped, multilayer PCLC flakes for color reflective displays. University of Rochester Undergraduate Research Symposium, Rochester, NY, 2009. *Professor's Choice Award.*

## **FUNDING**

Direct funds generated for Fromen lab to date: \$2,825,310

### **Current Research Support**

1. 2237430 PI: **Fromen, C.A.**, "CAREER: Aerosol transport in well-defined periodic porous metamaterials" National Science Foundation – Division of Chem, Bioeng, Env & Transp Sys (CBET). Project Period: 2/1/2023-1/31/2028. \$615,000 total.
2. *Selected for funding, pending partner negotiations.* PIs: Kloxin, A.M., Lenhoff, A.M., **Fromen, C.A.**, "PC5.2-108 Innovative scalable technologies for production of cell therapies" National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL). Project Period: 18 months. *Tentatively* 1/1/2023-6/30/2024. \$1,000,000 total (~\$215,000 for Fromen lab).
3. P200A210065 Project Director: Blenner, M., (Co-Director: **Fromen, C.A.**) "GAANN: Inclusive Teaching in Chemical Engineering (ITChE)" US Department of Education. Project Period: 10/1/2021 – 9/30/2024. \$910,188.
4. 1R35GM142866 PI: **Fromen, C.A.**, "Multiscale considerations for immune engineering at mucosal interfaces" National Institutes of Health – National Institute for General Medicine. Project Period: 7/2/2021- 05/31/2026. \$2,000,000 total, \$1,250,000 direct.

### **Completed Research Support**

1. 8A00279 PIs: Kloxin, A.M., Lenhoff, A.M., **Fromen, C.A.**, "Cell Separation, Processing, and Expansion for Cell Therapy Applications" Project Call 3.1-132. National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL). Project Period: 1 year. 9/1/2020-2/28/2022. \$343,750 direct. (\$114,583 for Fromen lab).
2. 20A00066 PI: **Fromen, C.A.**, "Tuning degradation rates of dry powder hydrogel nanoparticle formulations to drive antigen-specific immune responses in the lung" 2020 Research Starter Grant in Pharmaceuticals. PhRMA Foundation. Project Period: 02/01/2020-12/31/2021. \$100,000 direct.
3. P20GM104316B PI: **Fromen, C.A.**, "Surface-functionalized nanoparticle adjuvants for pulmonary immune modulation" UD COBRE Phase II Project 4 Lead. COBRE PI Fox - Discovery of Chemical Probes and Therapeutic Leads. National Institutes of Health. Project Period: 8/10/2020-6/30/23. \$1,500,000 total annual direct (\$433,000 direct to Fromen lab). (early end date of 9/30/20 due to R35 award).
4. PI: **Fromen, C.A.**, "Spatial measurement of aerosol deposition in 3D-printed structures" Delaware COBRE MRI Pilot Award. National Institutes of Health. Project Period: 8/1/2020-8/31/2021. \$7,000 direct.
5. PI: Gleghorn, J.P. "Inhalable microparticles for the treatment of COVID-19 within the airspaces" ACCEL Rapid Science Grants Program. DE-CTR ACCEL Program, National Institutes of Health. Project Period:

7/1/2020 – 1/31/2021. \$40,000 direct. (\$18,982 for Fromen lab; role: co-I).

6. PI: **Fromen, C.A.**, “Aged to Perfection: Enhancing Survival of Antigen Presenting Cells for Cancer Therapies” Delaware INBRE Pilot Project. National Institutes of Health. Project Period: 12/3/2019-10/31/2021 (early end date of 7/31/20 due to Fox COBRE award). \$160,000 direct.
7. PI: **Fromen, C.A.**, “Enhancing survival of phagocytes using inert-nanoparticle hydrogels” Delaware INBRE Core Center Access Award; DNA Sequencing & Genotyping Center and the CBCB Bioinformatics Core. National Institutes of Health. Project Period: 9/1/2019-5/1/2020. \$8,000 direct.
8. PI: **Fromen, C.A.**, “Optimizing Nanoparticle Delivery to Lung Dendritic Cell Subsets for Development of New Pulmonary Therapeutics” 2018 UDRF Award. University of Delaware Research Foundation. Project Period: 6/1/2018-5/31/2020. \$35,000 direct.
9. PIs: Bloch, E.D, **Fromen, C.A.**, “Molecularly-Defined Porous Nanoparticle Drug Carriers for Pulmonary Antimicrobial Therapeutics” UD COBRE Phase I Discovery pilot project. COBRE PI Fox - Discovery of Chemical Probes and Therapeutic Leads. National Institutes of Health. Project Period: 1/16/2019-5/31/2019. \$97,500 (\$48,750 direct for Fromen lab).
10. PIs: Bloch, E.D, **Fromen, C.A.**, “Design of Metal-Organic Cage Molecules for Aerosol Pulmonary Theranostics” UD COBRE Phase I Discovery pilot project. COBRE PI Fox - Discovery of Chemical Probes and Therapeutic Leads. National Institutes of Health. Project Period: 1/15/2018-5/31/2018. \$95,000 (\$47,500 direct for Fromen lab).

**--Work Prior to Univ. Delaware--**

11. PI: **Fromen, C.A.** “Nanoparticle adjuvant carriers for optimized vaccine designs and immune-modulators” UMOR Small Scale and Preliminary Projects Faculty Award. University of Michigan Office of Research. Project Period: 7/2016-5/2017. \$17,650 direct.

**RESEARCHERS SUPERVISED**

**Current Graduate Students**

- |   |   |                     |
|---|---|---------------------|
| 1. Jodi Graf  | CBE PhD student, co-advised w/A. Kloxin   | Fall 2022-present   |
| 2. Saiful Roslan  | CBE PhD student                           | Fall 2022-present   |
| 3. Eric Slaughter   | CBE PhD student, co-advised w/A. Kloxin   | Fall 2022-present   |
| 4. Spencer Wolfe  | CBE PhD student                           | Fall 2022-present   |
| 5. Emma Sudduth   | CBE PhD student                           | Spring 2022-present |
| <i>Awards: 2022 CBI Fellow</i>  |   |                     |
| 6. Yinkui Yu  | CBE PhD candidate                         | Fall 2021-present   |
| <i>Awards: 2021 Collins Chemical Engineering Fellow; UD CBE Qualifier &amp; coursework commendation</i>   |   |                     |
| 7. Michael Trautmann-Rodriguez  | CBE PhD candidate                         | Fall 2021-present   |
| 8. Daniel Liu   | CBE PhD student, co-advised w/M. Sullivan | Fall 2021-present   |
| 9. Kartik Bomb  | CBE PhD candidate, co-advised w/A. Kloxin | Fall 2018-present   |
| <i>Awards: 2019 Collins Chemical Engineering Fellow; Saurabh A. Palkar Graduate Award for Mentoring Fellowship</i>  |   |                     |
| 10. Ian Woodward  | CBE PhD candidate                         | Fall 2018-present   |
| <i>Awards: 2019 Collins Chemical Engineering Fellow; UD CBE Qualifier commendation; 2019 NSF GRFP Honorable Mention; 2020 Robert L. Pigford Teaching Assistant Award</i>                        |   |                     |
| 11. Emily Kolewe  | CBE PhD candidate                         | Fall 2017-present   |
| <i>Awards: UD CBE Qualifier commendation, 2020-2021 CBE Teaching Fellow, 2021 NIH NHLBI F31 Fellowship Recipient “Dynamic, Cellularized, 3D Printed Model Development for Aerosol Targeting</i> |   |                     |

in Pediatric JORRP Patients". 2022 Rosalind Franklin Society Award.

### Current Undergraduate Students

1. Nicole Gill CBE class of 2024 Fall 2022-present
2. Joaquina Somma CBE class of 2025 Spring 2022-present  
*Awards:* UD Summer Scholar 2021
3. Saurav Padhye CBE class of 2024 Spring 2021-present  
*Awards:* UD Summer Scholar 2021, 2022
4. Hannah Bockius BME class of 2023 Spring 2021-present
5. Simone Sabnis BME class of 2023 Spring 2021-present  
*Senior Thesis:* Identification of Pro-Survival Signal Secretions from Macrophages Treated with PEG-Based Nanoparticles  
*Awards:* UD Summer Scholar 2021

### Graduate Student Alumni

1. Zachary Stillman CBE PhD graduation Summer 2022 Fall 2017-Summer 2022  
*Dissertation:* Evaluating the Properties and Uses of Metal-Organic Framework (MOF) and Polymer Nanoparticles for Applications in Vaccines and Pulmonary Drug Delivery  
*Awards:* UD CBE Coursework commendation; 2019 G2/G3 CBI Fellow; 2019-20 Saurabh A. Palkar Graduate Award for Mentoring; 2020-21 Fraser and Shirley Russell Teaching Fellow  
*Currently:* Teaching position, UD CBE
2. Bader Jarai CBE PhD graduation Spring 2022 Fall 2017-Spring 2022  
*Dissertation:* Engineering Nanoparticle Interactions with Innate Immune Cells to Develop Pulmonary Therapeutic Vehicles and Cell Therapies  
*Awards:* 2020-2021 CBE Teaching Fellow  
*Currently:* Research scientist at Janssen Pharmaceuticals
3. Rickey Egan MEPT Masters student 2019-2020  
*Awards:* 2019-2020 UD Graduate Scholars Award  
*Currently:* Research scientist at Johns Hopkins Applied Physics Laboratory

### Undergraduate Student Alumni

1. Emmanuel Ortiz CBE class of 2026, UD Rise Summer 2022
2. Brendan Boggs CBE class of 2022 Summer 2021-Spring 2022
3. Aaron Lam CBE class of 2022 Spring 2021- Spring 2022  
*Awards:* UD Summer Scholar 2021
4. Emma Peterman CBE class of 2021 Spring 2018-Spring 2021  
*Senior Thesis:* Computational and *In Vitro* Modeling of Aerosol Diffusion Through Pulmonary Mucus to Optimize Viral Sponge Delivery for SARS-CoV-2 Treatment  
*Awards:* 1743 Distinguished Scholarship; UD Summer Scholar 2019, 2020; UD Goldwater Nomination 2019; CUR 2020 Posters on the Hill Honorable Mention, UD Summer Scholar 2020, NCSU Future Leaders in Chemical Engineering 2020; 2021 NSF GRFP Awardee; 2021 Charles B. Evans Prize; 2021 AAUP-UD Student Award  
*Currently:* PhD student at MIT Chemical Engineering (PI Galloway)
5. Lucas Attia CBE class of 2021 Fall 2017- Spring 2021  
*Senior Thesis:* Theoretical and Computational Modeling and Optimization of Fluid Flow through Regular Lattice Structures  
*Awards:* NASA DESG Summer Research Internship 2018, UD Summer Scholar 2019; UD Goldwater Nomination 2019; 2020-2021 Goldwater Scholar, NCSU Future Leaders in Chemical Engineering 2020, Harvard Munson Fellowship 2021; 2021 NSF GRFP Awardee (deferred); 2021 DOE Computational Science Graduate Fellowship (CSGF); 2021 AAUP-UD Student Award  
*Currently:* PhD student at MIT Chemical Engineering (PI Doyle)

- |     |   |                   |                         |
|-----|---|-------------------|-------------------------|
| 6.  | Premal Patel  | CBE class of 2021 | Fall 2017- Spring 2021  |
|     | <i>Senior Thesis:</i> Modeling and Simulation of Porous Nanoparticle Diffusion and Mucosal Penetration  |                   |                         |
|     | <i>Currently:</i> Associate Software Engineer, Veeva Systems  |                   |                         |
| 7.  | Nisha Raman   | CBE class of 2020 | Winter 2019-Spring 2020 |
|     | <i>Senior Thesis:</i> Modulating Immune Stimulation From TLR-Functionalized Nanoparticles to Optimize Adjuvant-Based Immunotherapies                          |                   |                         |
|     | <i>Awards:</i> McNair Scholar 2019; Harvard Munson Fellowship 2020; COE Charles B. Evans Prize 2020   |                   |                         |
|     | <i>Currently:</i> Associate Scientist Merck   |                   |                         |
| 8.  | Ellie Papoutsakis   | BME class of 2020 | Winter 2019-Spring 2020 |
|     | <i>Senior Thesis:</i> Culture of Epithelial Cell Monolayers on 3d Printed Surfaces Towards Development of a Novel <i>In Vitro</i> Respiratory Deposition Tool |                   |                         |
|     | <i>Awards:</i> UD Summer Scholar 2019   |                   |                         |
|     | <i>Currently:</i> Masters of Science and Business Program at Rutgers  |                   |                         |
| 9.  | Azeem Sharief   | CBE class of 2021 | Fall 2017-Spring 2019   |
|     | <i>Awards:</i> UD Summer Scholar 2018   |                   |                         |
| 10. | Shuja Abbas   | CBE class of 2020 | Fall 2017-Winter 2019   |
|     | <i>Awards:</i> NASA DESG Summer Research Internship 2018  |                   |                         |
| 11. | Daksh Jain  | CBE class of 2021 | Fall 2017-Winter 2019   |
|     | <i>Awards:</i> UD Summer Scholar 2018   |                   |                         |
| 12. | Justin Chernokal  | CBE class of 2020 | Winter 2018-Winter 2019 |
|     | <i>Awards:</i> UD Summer Scholar 2018   |                   |                         |

#### Other Trainee Alumni

- |    |              |                       |           |
|----|--------------|-----------------------|-----------|
| 1. | Teresa Cruz  | BISC graduate student | Sp21-Su22 |
| 2. | Areej Shahid | CBE graduate student  | W21-Su21  |

#### Thesis Committees of Graduate Students

- |     |                      |  |              |
|-----|----------------------|--|--------------|
| 1.  | Harrison Lawson      | ChemE CMU PhD student, advisor Wayne/Zheng             | S23-present  |
| 2.  | Somdeepa Chakraborti | Biology PhD student, advisor Duncan                    | S22-present  |
| 3.  | Christopher Mayhugh  | CBE PhD candidate, advisor Kunjapur                    | F21-present  |
| 4.  | Akash Vaidya         | CBE PhD candidate, advisor Solomon                     | Sp21-present |
| 5.  | Elise Hoover         | BME PhD candidate, advisor Day                         | Sp21-present |
| 6.  | Brian S. Bentley     | Chemistry & Biochemistry PhD candidate, advisor Grimes | F20-present  |
| 7.  | Mackenzie Scully     | BME PhD candidate, advisor Day                         | Sp20-present |
| 8.  | N'Dea Irvin-Choy     | BME PhD candidate, advisor Day/Gleghorn                | Sp20-present |
| 9.  | Christian Heil       | CBE PhD candidate, advisor Jayaraman                   | W20-present  |
| 10. | Michael Donzanti     | BME PhD candidate, advisor Gleghorn                    | W20-present  |
| 11. | Jessica Belliveau    | CBE PhD candidate, advisor Papoutsakis                 | W20-present  |
| 12. | William Thompson     | CBE PhD candidate, advisor Papoutsakis                 | F19-present  |
| 13. | Jonathan Otten       | CBE PhD candidate, advisor Papoutsakis                 | Sp19-present |
| 14. | Benjamin Luo         | BME Masters graduate, advisor Day                      | Sp19-W21     |
| 15. | Samantha Cassel      | CBE PhD candidate, advisor A Kloxin                    | Sp9-present  |
| 16. | Esther Roh           | CBE PhD candidate, advisors Epps/Sullivan              | Sp19-W22     |
| 17. | Megan Dang           | BME PhD graduate, advisor Day                          | Sp19-S22     |
| 18. | Jay Decker           | Chemistry PhD graduate, advisor Bloch                  | Sp18-Sp21    |

#### Thesis Committees of Undergraduate Students

- |    |                    |   |           |
|----|--------------------|---|-----------|
| 1. | Simone Sabnis      | BME major, advisor Fromen                   | Sp22-Sp23 |
| 2. | Tohn Borjgin       | CBE major, advisor Sullivan, second reader  | Sp21-Sp22 |
| 3. | Nolan Petrich      | CBE major, advisor C. Kloxin, second reader | Sp21-Sp22 |
| 4. | Geoffrey Bonnanzio | CBE major, advisor Jayaraman, second reader | Sp21-Sp22 |
| 5. | Lucas Attia        | CBE major, advisor Fromen                   | Sp20-Sp21 |



6. Emma Peterman	CBE major, advisor Fromen	Sp20-Sp21
7. Premal Patel	CBE major, advisor Fromen	Sp20-Sp21
8. Shirley Jin	CBE major, advisor Papoutsakis, second reader	Sp20-Sp21
9. Nisha Raman	CBE major, advisor Fromen	2019-2020
10. Ellie Papoutsakis	BME major, advisor Fromen	2019-2020

### **CBI Rotation Graduate Students**

1. Emma Sudduth	CBE PhD candidate; Fromen	Winter 2022
2. Teresa Cruz	Biology PhD candidate; Fromen	Spring 2021
3. Ellie Meck	Chemistry PhD candidate; D Watson	Fall 2020
4. Stephanie Tsang	Chemistry PhD candidate; Fox	Fall 2020
5. Joshua Jachuck	CBE PhD candidate; Papoutsakis	Spring 2020
6. Samantha Gillis	Biology PhD candidate; Yien	Winter 2019
7. Katherine Nelson	CBE PhD candidate; Gleghorn	Spring 2018

## **TEACHING EXPERIENCE**

### **Courses Instructed**

• CHEG 843 Rate Processes & Dynamics for Mammalian Cellular Systems	19 students, grad core course, with A. Kloxin	Spring 2023
• CHEG 603/803 Science Communication	56 students, grad core course, with A. Kloxin	Spring 2023
• CHEG 654/854 Vaccines & ImmunoEngineering	48 students, grad elective	Fall 2022
• CHEG 800 Graduate Seminar	47 students, core course	Fall 2022
• CHEG 843 Rate Processes & Dynamics for Mammalian Cellular Systems	18 students, new core course, with A. Kloxin	Spring 2022
• CHEG 603/803 Science Communication	56 students, new core course, with A. Kloxin	Spring 2022
• CHEG 800 Graduate Seminar	42 students, new core course	Fall 2021
• CHEG 667/867 Vaccines & ImmunoEngineering	51 students; online	Spring 2021
• CHEG 341 Fluid Dynamics	97 students, core, online Mentored teaching fellow E. Kolewe	Fall 2020
• CHEG 667/867 Vaccines & ImmunoEngineering	32 students; online transition	Spring 2020
• CHEG 341 Fluid Dynamics	78 students; core; with J. Tilton Mentored teaching fellow J. Horner	Fall 2019
• CHEG 667/867 Vaccines & ImmunoEngineering	39 students; new elective	Spring 2019
• CHEG 341 Fluid Dynamics	69 students; core with J. Tilton Mentored teaching fellow K. Wiley	Fall 2018
• CHEG 341 Fluid Dynamics	86 students; core with J. Tilton,	Fall 2017

### **Guest Lectures**

• CHEG 867-016/667-01 Advanced Cell Culture Biomanufacturing	Fall 2022
• CHEG 867-016/667-01 Advanced Cell Culture Biomanufacturing	Fall 2021
• CHEG 867-016/667-01 Advanced Cell Culture Biomanufacturing	Fall 2020
• HONR 267-081 Grand Challenges for Innovation and Society	Spring 2020
• HONR 267-081 Grand Challenges for Innovation and Society	Spring 2018

### **Participation in Teaching & Mentoring Workshops**

• National Research Mentoring Network Culturally Aware Mentoring (CAM), virtual	January 2021
• Optimizing the Practice of Mentoring 101: For Research Mentors of Graduate Students, Fellows, and Early-Career Faculty, virtual (Univ. Minnesota)	December 2020
• Delivering Learning Experiences Online (DLEO)	July 2020

- Problem Based Learning (PBL) 2019, University of Delaware January 2019

### **Student Advising**

- Undergraduate Academic Advisor (23 CHEG students in class of 2026) F2022-present
- UD Engineering Senior Design Mentor (Two teams) Fall 2020
- Undergraduate Academic Advisor (24 CHEG students in class of 2022) F2018-Sp2022

## **PROFESSIONAL SERVICE**

### **Membership in Professional Organizations**

- Society for Biomaterials (SFBiomaterials) 2022-present
- American Association of Pharmaceutical Scientists (AAPS) 2021-present
- Controlled Release Society (CRS) 2020-present
- Society for Women in Engineering (SWE) 2020-present
- American Society for Engineering Education (ASEE) 2020-present
- Biomedical Engineering Society (BMES) 2019-present
- European Respiratory Society (ERS) 2018-present
- American Association for Cancer Research (AACR) 2018-2019
- American Thoracic Society (ATS) 2017-present
- American Association for the Advancement of Science (AAAS) 2017-present
- American Chemical Society (ACS) 2016-present
- International Society for Aerosols in Medicine (ISAM) 2013-present
- American Institute of Chemical Engineers (AIChE) 2009-present

### **Participation in Professional Development Courses**

- AIChE CH138VTL: Project Management for Chemical Engineers Sept 2022

### **Leadership Roles in Professional Organizations**

- ISAM Award Committee Chair Spring 2021-present
- Women in ISAM Networking Chair Summer 2019-present
- AAPS Inhalation and Nasal Community (INC) Learning Opportunity Manager Fall 2021-present

### **Review Panels**

- Ad hoc consultant NIH NIGMS Council Feb 2023
- National Science Centre Poland Proposal Evaluation 2021
- DE ACCEL Professional Development Core Pilot and MRDA Review 2021
- Ad hoc technical reviewer for European Science Foundation - Research Projects of the Research Foundation Flanders (FWO) 2021
- CDMRP Peer Review Medical Research Program PRMRP panel reviewer 2020
- Ad hoc technical reviewer for Maryland Industrial Partnerships Program 2020
- Ad hoc reviewer BSF (United States-Israel Binational Science Foundation) 2020
- NSF GRFP panel member – Biomedical Engineering 2020
- NSF DMR ad hoc member 2018

### **Invited Workshops**

- “Physics to Pharma: Using Surfactant Driven Flows to Improve Inhaled Therapies –a translational workshop” Pittsburgh, PA. 13 total expert participants September 21-22, 2018

### **Workshop Organization**

- SCONA - Society for Computational fluid dynamics Of the Nose and Airway 2022. January 28, 2022  
Co-Convener. Virtual workshop January 28, 2022
- ISAM 2020 Workshop Organizing Committee Member. Workshop in Philadelphia, PA, May 15, 2020. *\*conference canceled due to SARS\_COV2* May 15, 2020

### **Conference Organization - Programming**

- Area 8B Biomaterials 2024 Chair, AIChE Annual Meeting, San Diego, CA 2024 November 2024
- Area 8B Biomaterials 2023 Vice Chair, AIChE Annual Meeting, Orlando, FL 2023 November 2023
- ATS Respiratory Structure and Function (RSF) Assembly Programming May 2023

- Committee. ATS 2023 Annual Meeting Washington, DC 2023
  - Area Coordinator, Biomedical Technologies. ACS BIOT Spring Annual Meeting Indianapolis, IN 2023 March 2023
  - Area 22B Bionanotechnology Co-Chair in Nanoscale Science and Engineering Forum program, AIChE Annual Meeting, Phoenix, AZ 2022 November 2022
  - ATS Respiratory Structure and Function (RSF) Assembly Programming Committee. ATS 2022 Annual Meeting May 2022
  - E.V. Murphee Award in Industrial and Engineering Chemistry Award Symposium, ACS Spring Meeting, POLY Division, San Diego, CA 2022 March 2022
  - Area 22B Bionanotechnology Co-Chair in Nanoscale Science and Engineering Forum program, AIChE Annual Meeting, Boston, MA 2021 November 2021
  - ACS 2021 Middle Atlantic Regional Meeting (MARM) “Diversity in Polymer Chemistry and Engineering” Session Organizer June 2021
  - ISAM 2021 “Hot Topics” and “Best in Oral” Sessions Organizer May 2021
  - ATS Respiratory Structure and Function (RSF) Assembly Programming Committee. ATS 2021 Annual Meeting, San Diego, CA, May 14-19, 2021. *\*virtual* May 2021
  - Abstract Reviewer for Respiratory Bioengineering Track, BMES Annual Meeting, San Diego, CA 2020 *\*virtual due to SARS-CoV-2* October 2020
  - Area 15D/E Drug Delivery Co-Chair in Engineering Fundamentals in Life Sciences program, AIChE Annual Meeting, San Francisco, CA 2020 *\*virtual due to SARS-CoV-2* November 2020
  - Area 22B Bionanotechnology Co-Chair in Nanoscale Science and Engineering Forum program, AIChE Annual Meeting, San Francisco, CA 2020 *\*virtual due to SARS-CoV-2* November 2020
  - Abstract Reviewer for BIOT Biomolecular Technology Area, ACS National Meeting, Philadelphia, PA 2020 *\*rescheduled due to SARS-CoV-2* March/August 2020
  - Area 22B Bionanotechnology Co-Chair in Nanoscale Science and Engineering Forum program, AIChE Annual Meeting, Orlando, FL 2019 November 2019
  - Abstract Reviewer for Respiratory Bioengineering Track, BMES Annual Meeting, Philadelphia, PA 2019 October 2019
- Conference Organization – Session Chair or Co-Chair**
- Session chair for ATS Respiratory Structure and Function (RSF) RSF-TP03: Airway Injury And Repair: Mechanisms And Treatment. ATS 2023 Annual Meeting Washington, DC. May 2023
  - Session chair for: Area 8B “Plenary in Biomaterials” and Area 22B “Bionanotechnology Graduate Student Award Session” and “Bionanotechnology Plenary”. AIChE Annual Meeting, Phoenix, AZ. November 2022
  - Poster judge and Young Scientist Committee Scientific Workshop for CRS 2022 Annual Meeting, Montreal CA July 2022
  - Session chair for BIOT “Imaging, Diagnostics, and Other Integrative Approaches to Study and Model Diseases” ACS BIOT Spring 2022. San Diego CA March 2022
  - Session chair for: Area 8B “Plenary in Biomaterials” and Area 22B “Bionanotechnology Graduate Student Award Session” and “Bionanotechnology Plenary”. AIChE Annual Meeting, Boston, MA November 2021
  - Moderator “Preclinical Development/ Clinical Pharmacology 4” AAPS National Meeting, Philadelphia, PA 2021 October 20, 2021
  - BIOT “Formulation strategies and novel routes of administration” and “How COVID-19 Changed My Research Path: The Good, the Bad, and the Ugly” Session Chair, ACS National Meeting, Atlanta, GA 2021 August 2021
  - ISAM 2021 “Hot Topics” and “Best-in-Oral-Presentation” Session Chair May 2021
  - Session chair for: Area 8B “Biomaterials for Drug Delivery: Controlled Release”, “Biomaterials for Drug Delivery: Overcoming Barriers”, “Biomaterials for Drug Delivery: New Approaches” Area 15D/E “Multi-scale Transport Considerations for

Drug Delivery”, and Area 22B “Bionanotechnology Graduate Student Award Session”. AIChE Annual Meeting, virtual San Francisco, CA, 2020 \*virtual due to SARS-CoV-2

- BIOT Biomolecular Technology Area Session Chair, ACS National Meeting, Philadelphia, PA 2020 \*conference postponed due to SARS\_COV2 March 2020
- Area 22B “Bionanotechnology Graduate Student Award Session I and II” AIChE Annual Meeting, Orlando, FL 2019 November 2019
- Area 8B “Biomaterials for Immunological Applications”, AIChE Annual Meeting, Orlando, FL 2019 November 2019
- Respiratory and Vascular Drug Delivery, BMES Annual Meeting, Philadelphia, PA 2019 October 2019
- Modeling the Respiratory System and Drug Delivery, BMES Annual Meeting, Philadelphia, PA 2019 October 2019
- PMSE Young Investigator Symposium, ACS National Meeting, Boston MA, 2018 August 2018

### Journal Boards

- Inaugural Early Career Board Member *ACS Biomaterials Science and Engineering* Spring 2018-2021

### Journal Editor

- Guest Associate Editor, *Frontiers in Pharmacology* March 2020

### Journal Reviewer

*PNAS, Sci Advances, Nat Materials, Adv Therapeutics, Adv Healthcare Materials, Exp Biol & Med, ACS Biomater Sci Eng, Sci Rep, Biochem Eng J, J Mater Chem B/C, PLOS One, Integrat Biol, Micromachines, Colloid Surface B, AIChE J, Pharmaceutics, Biomicrofluidics, J Polym Res, Mol Pharm, J Biomed Mater Res B, Nanoscale Advances, J Aerosol Sci, RCS Advances, Macromol Biosci, J Am Chem Soc, Eur J Pharm Biopharm, J Royal Soc Interfaces, Colloids & Surfaces:B, ASME Journal, Int J Pharmaceutics, Colloid & Polym Sci, Interface Focus, Advanced Materials, J Exposure Sci & Environ Epidemiol, Biomacromolecules, Cellular and Molecular Bioengineering, Biomaterials Sci, Pharm Res, Bioactive Materials, Additive Manufacturing, Matter, ACS Nano, PLOS Computational Biology, ACS Applied Nano Materials, Acta Biomaterialia, ACS Applied Materials, Aerosol Sci & Technol, Therapeutic Delivery*

### University of Delaware CBE Department Level Service

- UD CBE ad hoc Bylaws Committee Fall 2022-present
- Faculty Mentor –A. Bayles (CBE) Fall 2022-present
- Co-Chair of ad hoc UD CBE Community/Mentoring & Morale Committee Spring 2021-present
- UD CBE Safety Committee Member Fall 2019-present
- UD CBE Undergraduate Study Hall Faculty Leader Fall 2019-Spring 2020
- EmPOWER Faculty Member Mentor Fall 2018-present
- REACH Faculty Member Mentor Fall 2018-Spring 2019
- Faculty Search Committee Member Fall 2018-Spring 2019
- Fraser and Shirley Russel Graduate Teaching Fellow Committee Member Spring 2018-Spring 2019
- CBE Seminar Organizer Fall 2017-Spring 2019

### University of Delaware Service

- Women in Engineering (WIE) Graduate Student Steering Group Faculty Advisor Summer 2020-present
- COE Young Faculty Chair Winter 2020-present
- Society of Women Engineers (SWE) Faculty Advisor Winter 2020-present
- COE Faculty Secretary November 2019-present
- Faculty Search Committee Member, UD Chemistry Dept. Inorganic Search Fall 2019-Spring 2020

### External Mentorship

- Lexie Adams, Stanford PhD Student, ~1-2 meetings /semester S23-present
- Mariah Arral, CMU PhD Student, ~2-3 meetings/semester F20-present

## Community Outreach

- Fresh EGGG Podcast Guest Speaker (UD EGGG101 course) August 2021
- NCS Outstanding Student Awards Ceremony 35U35 Panelist November 19, 2020
- Alpha Omega Epsilon's Engineering Discovery Day "What is Chemical Engineering" invited speaker. ~20 female high school participants. virtual November 7, 2020
- Fresh EGGG Podcast Guest Speaker (UD EGGG101 course) August 27, 2020
- MRS Bulletin Podcast Guest Speaker with Phillip Ball July 2020
- Science Café Presentation "'Breathe it in: the Next Generation of Inhaled Medicines" November 19, 2019
- UD COE K-12 Outreach Camp Lecturer Summer 2019
- DE Governor's School Guest Speaker July 2019
- UD CBE REACH Engineering Day Faculty Leader. ~30 high school participants. March 8, 2019
- Alpha Omega Epsilon's Engineering Discovery Day "What is Chemical Engineering" invited speaker. ~50 female high school participants. November 10, 2018
- Women Success Panel Member at University of Missouri's Women in Engineering Week. ~50 female and minority undergraduate participants. April 16, 2018
- UD GOLEAD "Why get a PhD" invited speaker. ~20 female undergraduate participants. April 14, 2018
- UD Rise and Science radio interview. Episode 76 "Journey to Professorship and Engineering Lung-Particle Interactions" November 2017
- UM ChE GradChat invited panelist in "How to get a Great Postdoc/Faculty Position" August 2016
- DeSimone Lab Organizer of UNC Science Expo Annual Booth, University of North Carolina at Chapel Hill 2011-2013
- Secretary of Chemical and Biomolecular Engineering Graduate Student Association, North Carolina State University 2010-2011