

# Monica E. Shapiro

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Department of Chemical & Petroleum Engineering, University of Pittsburgh, 940 Benedum Hall,  
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## Research Interests

Dynamical systems modeling and simulation, parameter optimization, forecasting, uncertainty.

## Education

### University of Pittsburgh

Ph.D. in Chemical Engineering, GPA – 3.88

**Thesis Advisors:** Robert S. Parker, Ph.D. and Timothy E. Corcoran, Ph.D.

Pittsburgh, PA

2017 – Present

### Lehigh University

B.S. in Chemical Engineering, GPA – 3.48

Bethlehem, PA

2013 – 2017

## Research Positions

### University of Pittsburgh

Graduate Student Researcher

2017 – Present

**Thesis Title:** "Towards Personalized Medicine in Cystic Fibrosis: Patient-Specific Modeling of Mucociliary Clearance and Airway Surface Liquid Absorption"

**Advisors:** Robert Parker and Timothy Corcoran

Developed a physiologically-based mathematical model of mucociliary clearance in different regions of the lung to investigate differences in therapeutic response amongst cystic fibrosis patients. Work will be extended to capture paracellular fluid absorption and link behavior across scales. Built a Python package (plepy) for analyzing parameter uncertainty in path-constrained systems.

REU Intern

Summer 2016

**Advisors:** Robert Parker and Timothy Knab

Developed a graphical user interface for mathematical models of IV chemotherapy treatment for solid tumors. Adapted existing models to enable real-time updates to model parameters for drug sensitivity on a patient-specific basis.

### Lehigh University

Undergraduate Researcher

Fall 2016

**Advisor:** Jeetain Mittal

Ran molecular dynamic simulations of single-stranded DNA near a carbon nanotube to calculate binding energies in the presence of analytes for applications in biosensors.

## Publications

1. Serrano Castillo, F., ..., **Shapiro, M. E.**, et al. "A physiologically-motivated model of cystic fibrosis liquid and solute transport dynamics across primary human nasal epithelia." *Journal of Pharmacokinetics and Pharmacodynamics* (2019).
2. **Shapiro, M. E.**, Corcoran, T. E., Bertrand, C. A., Serrano Castillo, F. & Parker, R. S. "Physiologically-Based Model of Fluid Absorption and Mucociliary Clearance in Cystic Fibrosis." *IFAC PapersOnLine* **51**, 102–103 (2018).
3. Serrano Castillo, F., Bertrand, C. A., Corcoran, T. E., **Shapiro, M. E.** & Parker, R. S. "A Dynamic Model of Cystic Fibrosis Airway Epithelium Electrophysiology." *IFAC PapersOnLine* **51**, 94–97 (2018)

## Awards and Honors

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### Outstanding Teaching Assistant Award

*Awarded by the Engineering Graduate Student Organization.*

University of Pittsburgh

2021

### Research Experience for Undergraduates (REU)

*Host Institution: University of Pittsburgh*

National Science Foundation

2016

### Elisha P. Wilbur Mathematics Prize

*Awarded to the highest ranking freshman engineers in mathematics.*

Lehigh University

2014

### Dean's List

Lehigh University

Spring 2014, Fall 2013

## Conference Presentations

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1. Shapiro, M. E., Parker, R. S., Bertrand, C. A., Serrano Castillo, F. & Corcoran, T. E. "Mathematical Model of Mucociliary Clearance and Airway Surface Liquid Absorption Dynamics." Poster presentation at *North American Cystic Fibrosis Conference (NACFC)*, **Nashville, TN**, 2019.
2. Shapiro, M. E., Corcoran, T. E., Bertrand, C. A., Serrano Castillo, F. & Parker, R. S. "Physiologically-Based Model of Fluid Absorption and Mucociliary Clearance in Cystic Fibrosis." Poster presentation at *Foundations of Systems Biology in Engineering (FOSBE)*, **Chicago, IL**, 2018.

## Teaching

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### Reactive Process Engineering (CHE 0400)

*Teaching Assistant*

University of Pittsburgh

Spring 2021

Taught weekly virtual recitations, held office hours, made solution guides, and graded. Designed introductory MATLAB recitation. Won **Outstanding TA Award** for my role in this course.

### Engineering a Craft Brewery (ENGR 1933)

*Grader*

University of Pittsburgh  
Spring 2021, Spring 2020, Spring 2019, Spring 2018

Graded final exam, homeworks, and sensory perception quizzes.

### Systems Engineering I: Dynamics and Modeling (CHE 0500)

*Teaching Assistant*

University of Pittsburgh

Fall 2019, Fall 2018

Taught weekly recitations using Simulink/MATLAB, held office hours, and graded.

### Methods of Analysis in Chemical Engineering (CHE 201)

*Apprentice Teacher*

Lehigh University

Fall 2016

Assisted with weekly computational labs using MATLAB, Excel, and Aspen Plus. Led lab when instructor was absent. Held weekly office hours and graded.

## Leadership Roles

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- o Graduate Women in Engineering Network – President (2020 – Present), Treasurer (2019 – 2020)
- o Ingenium – Editorial Board (2019 – Present)
- o Chemical Engineering Graduate Safety Committee – Lab Representative (2018 – 2020)
- o Chemical Engineering Graduate Student Association – Recruitment Chair (2018 – 2019)

## Skills

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**Computer Skills:** Python, MATLAB/Simulink, R, Blender, HTML5/CSS, Aspen Plus/Dynamics, Microsoft Office Suite

**Languages:** Native - English; Familiar - French

**Relevant Coursework:** Bayesian Signal Processing, Optimal Control, Statistical & Computational Methods for Systems Biology, Data Inference & Applied Machine Learning, Advanced Scientific Visual Communication, Molecular Modeling and Simulation