Monica E. Shapiro

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Department of Chemical & Petroleum Engineering, University of Pittsburgh, 940 Benedum Hall, Pittsburgh, PA 15261

Research Interests

Dynamical systems modeling and simulation, systems medicine, systems biology, pharmacokinetics, pharmacodynamics, optimization.

Education

University of Pittsburgh **Pittsburgh, PA**
Ph.D. in Chemical Engineering, GPA – 3.89 *2017 – Present*
Thesis Advisors: Robert S. Parker, Ph.D. and Timothy E. Corcoran, Ph.D.

Lehigh University **Bethlehem, PA**
B.S. in Chemical Engineering, GPA – 3.48 *2013 – 2017*

Research Positions

University of Pittsburgh

Graduate Student Researcher *2017 – Present*
Advisors: Robert Parker and Timothy Corcoran

Working to develop a multi-scale mathematical model of cystic fibrosis in Python by linking models at the cell, tissue, and organ levels. Extended an existing dynamic model of mucociliary clearance and liquid absorption to capture observed differences in sequential nuclear imaging data between lung regions. By relating subject-specific model parameters across scales, we aim to understand how changes at the cell scale drive the response observed in the lungs. In future, this could be used to predict how a specific patient will respond to different inhaled osmotic therapies.

REU Intern *Summer 2016*
Advisors: Robert Parker and Timothy Knab

Developed a graphical user interface that allows users to interact with mathematical models of IV chemotherapy treatment for solid tumors. Adapted existing models to enable real-time clinical measurements to be used to update model parameters for drug sensitivity on a patient-specific basis.

Lehigh University

Undergraduate Researcher *Fall 2016*
Advisor: Jeetain Mittal

Ran molecular dynamic simulations using coarse-grained models of single-stranded DNA near a carbon nanotube to understand how it behaves alone and in the presence of analytes. In future, this technology could be used to develop better 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

Research Experience for Undergraduates (REU) — **National Science Foundation**
Host Institution: University of Pittsburgh — *2016*

Elisha P. Wilbur Mathematics Prize — **Lehigh University**
Awarded to the highest ranking freshman engineers in mathematics. — *2014*

Dean's List — **Lehigh University**
Spring 2014, Fall 2013

Conference Presentations

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.
3. Shapiro, M. E., Knab, T. D., Carcillo, C. M & Parker, R. S. "Interactive Interface for Designing Docetaxel Treatment Schedules in Cancer Chemotherapy." Poster presentation at *Duquesne Summer Undergraduate Research Symposium*, **Pittsburgh, PA**, 2016.

Teaching

Engineering a Craft Brewery (ENGR 1933) — **University of Pittsburgh**
Grader — *Spring 2020, Spring 2019, Spring 2018*
Graded final exam, homeworks, and sensory perception quizzes.

Systems Engineering I: Dynamics and Modeling (CHE 0500) — **University of Pittsburgh**
Teaching Assistant — *Fall 2019, Fall 2018*
Taught weekly recitations using Simulink/MATLAB, held office hours, and graded.

Methods of Analysis in Chemical Engineering (CHE 201) — **Lehigh University**
Apprentice Teacher — *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.

Professional Memberships and Leadership Roles

- Ingenium – Editorial Board (2019 – Present)
- Graduate Women in Engineering Network – President (2020 – Present), Treasurer (2019 – 2020)
- Chemical Engineering Graduate Safety Committee – Lab Representative (2018 – Present)
- Chemical Engineering Graduate Student Association – Recruitment Chair (2018 – 2019)
- American Institute of Chemical Engineers – Member (2014 – Present)
- Alpha Phi Omega (service fraternity) – Member (2014 – 2017)

Skills

Computer Skills: Python, MATLAB/Simulink, R, Blender, Aspen Plus/Dynamics, Microsoft Office Suite
Languages: Native - English; Familiar - French
Relevant Coursework: Statistical & Computational Methods for Systems Biology, Bayesian Signal Processing, Optimal Control, Data Inference & Applied Machine Learning, Advanced Scientific Visual Communication, Molecular Modeling and Simulation