Anna K. Miller

Contact Information

Integrated Mathematical Oncology
Moffitt Cancer Center, SRB-4
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Research Interests

Mathematical Biology, Mathematical Oncology, Tumor Microenvironment, Drug Resistance, Eco-evolutionary Dynamics, Evolutionary Therapies, Human Papillomavirus, Cell Biology.

Research Position

Applied Postdoctoral Fellow
Integrated Mathematical Oncology, Moffitt Cancer Center — 2018-current
- Modeling environment-mediated drug resistance using hybrid agent-based models.

Education

University of Utah — 2010-2018
Ph.D., Mathematics
- Dissertation: Mathematical Modeling of Epithelial Cell Division: Evaluating the Effects of Human Papillomavirus Infection
- Advisor: Frederick R. Adler

M.S., Mathematics — 2017

University of North Carolina, Chapel Hill — 2006-2010
B.S., Mathematics
Minor in Hispanic Studies

Teaching/ Mentoring Experience

Society for Mathematical Biology
Mentorship Program — Summer 2019-2021
- Served as a mentor at the annual meeting

Moffitt Cancer Center
Student Mentor — Summer 2018-2019
- Mentored a student that participated in the High School Internship Program in Mathematical Oncology (HIP-IMO)

University of Utah
Course Instructor
- Math 1050: College Algebra (Spring 2013, Fall 2015, Spring 2016, Fall 2017)
- Math 1030: Introduction to Quantitative Reasoning (Fall 2012)
- Math 1010: Intermediate Algebra (Fall 2011)

Lab Instructor
- Math 4600: Mathematics in Physiology and Medicine (Spring 2015)
- Math 2250: Differential Equations and Linear Algebra (Spring 2012)

Teaching Assistant
- Math 5120: Mathematical Biology II (Spring 2014)
- Math 5110: Mathematical Biology I (Fall 2013, Fall 2014)

Math Help Center Tutor (Spring 2012, Fall 2012)

Technical Skills

Most experience: R, LaTeX, MATLAB, Java
Some experience: Maple, Mathematica, XPP/XPPAUT, HTML, QuPath

Publications

S. Jerez, E. Pliego, F. J. Solis, **A. K. Miller**. Antigen receptor therapy in bone metastasis via optimal control for different human life stages. *Journal of Mathematical Biology*. 83(4):1-27, 2021.

N. Huntly, A. R. Freischel, **A. K. Miller**, M. C. Lloyd, D. Basanta, and J. S. Brown. Coexistence of "Cream Skimmer" and "Crumb Picker" Phenotypes in Nature and in Cancer. *Frontiers in Ecology and Evolution*. 9:697618, 2021.

A. K. Miller, J. S. Brown, H. Enderling, D. Basanta, and C. J. Whelan. The Evolutionary Ecology of Dormancy in Nature and in Cancer. *Frontiers in Ecology and Evolution*, 9:676802, 2021.

A. K. Miller, J. S. Brown, D. Basanta, and N. Huntly. What Is the Storage Effect, Why Should It Occur in Cancers, and How Can It Inform Cancer Therapy? *Cancer Control*, 27(3):1073274820941968, 2020.

R. R. Bravo, E. Baratchart, J. West, R. O. Schenck, **A. K. Miller**, J. Gallaher, C. D. Gatenbee, D. Basanta, M. Robertson-Tessi, and A. R. Anderson. Hybrid Automata Library: A flexible platform for hybrid modeling with real-time visualization. *PLoS computational biology*, 16(3): e1007635, 2020.

A. K. Miller, K. Munger, and F. R. Adler. A Mathematical Model of Cell Cycle Dysregulation Due to Human Papillomavirus Infection. *Bulletin of Mathematical Biology*, 79:1564-1585, 2017.

P-I Ku*, **A. K. Miller***, J. Ballew, V. Sandrin, F. R. Adler, and S. Saffarian. Identification of pauses during formation of HIV-1 Virus like particles. *Biophysical Journal*, 105:2262-2272, 2013.

* Denotes equal contribution

Conferences

Pfizer ECD QSP Group Meeting October 2021
Virtual
Invited Talk: The evolution of multiple myeloma in the bone microenvironment: from bone homeostasis to environment mediated drug resistance

CSBC/PS-ON/BD-STEP Junior Investigator Meeting August 2021
Virtual
Contributed Talk: Examining environment-mediated drug resistance in multiple myeloma with a hybrid agent based model

PS-ON Annual Investigators Meeting August 2021
Virtual
Poster: A biology-driven computational model of the interplay between the bone microenvironment and treatment response in multiple myeloma; **Poster Prize**

Annual Meeting of the Society for Mathematical Biology June 2021
Virtual
Contributed Talk: An integrated computational model of multiple myeloma-bone dynamics under treatment
Organizer: Minisymposium on Predicting ecological dynamics in fluctuating environments

Moffitt Virtual Scientific Symposium April 2021
Virtual
Poster: A spatial model of the multiple myeloma-bone vicious cycle and the response to standard of care treatments

PS-ON Annual Investigators Meeting September 2020
Virtual
Poster video: An integrated biological and computational approach to model the dynamics of the bone-multiple myeloma vicious cycle; **Poster Prize**

CSBC/PS-ON/BD-STEP Junior Investigator Meeting August 2020
Virtual
Poster video: Agent based modeling of the bone ecosystem: creating a biology-driven platform to explore microenvironmental selection in multiple myeloma

Annual Meeting of the Society for Mathematical Biology August 2020
Virtual
Contributed Talk: Modeling the spatiotemporal dynamics of the vicious cycle in multiple myeloma

Moffitt Virtual Scientific Symposium May 2020
Virtual
Contributed Talk: Agent based modeling of the bone ecosystem: creating a biology-driven platform to explore microenvironmental selection in multiple myeloma; **Oral Presentation Prize**

Duke University Mathematical Biology Seminar February 2020
Durham, NC
Invited Talk: Agent based modeling of the bone ecosystem: creating a biology-driven platform to explore microenvironmental selection in multiple myeloma

Cancer Biology and Evolution (CBE) Symposium October 2019
Tampa, FL
Poster Highlight: An Agent Based Model of the Bone Microenvironment in Multiple Myeloma

Annual Meeting of the Society for Mathematical Biology July 2019
Montreal, Canada
Contributed Talk: Towards a Multiscale Model of the Bone Microenvironment in Multiple Myeloma

Moffitt Scientific Symposium May 2019
Tampa, FL
Poster: Towards a Multiscale Model of the Bone Microenvironment in Multiple Myeloma

QSP Summit April 2019
Boston, MA
Poster and Lightning Talk: Towards a Multiscale Model of the Bone Microenvironment in Multiple Myeloma; **First Place Poster Prize**

Cancer Evolution & Ecology: Theory and Clinical Practice May 2018
St. Petersburg, FL

IMAG Futures Meeting–Moving Forward with the Multiscale Modeling Consortium March 2018
Bethesda, MD

DeCART: Data Science for the Health Sciences July 2017
Salt Lake City, UT
Invited Talk: Predicting HPV infection dynamics in tissue through mathematical modeling

Annual Meeting of the Society for Mathematical Biology July 2017
Salt Lake City, UT
Poster: A Mathematical model of HPV and the disruption of tissue homeostasis; **BioFire Poster Prize**

Annual Meeting of the Society for Mathematical Biology and European Conference for Mathematical and Theoretical Biology July 2016
Nottingham, United Kingdom
Invited Talk: A mathematical model of cell proliferation in epithelial tissue due to human papillomavirus infection

HPV-U01 Annual Meeting May 2016
University of Michigan, Ann Arbor, MI
Invited Talk: A mathematical model of cell proliferation in epithelial tissue due to human papillomavirus infection

AMS Spring Western Sectional Meeting April 2016
Salt Lake City, UT
Organizer: Special Session on Structure and Emergent Properties of Biological Networks

Annual Meeting of the Society for Mathematical Biology and Japanese Society for Mathematical Biology July 2014
Osaka, Japan
Contributed Talk: A quantitative comparison of high-risk and low-risk human papillomavirus manipulation of the epithelial cell cycle

Biophysical Society 57th Annual Meeting February 2013
Philadelphia, PA
Poster: Steps within the assembly of HIV-1

Workshops

Quantitative Systems Pharmacology Approaches to Problems in the Pharmaceutical Industry August 2021
The Fields Institute, Virtual

Workshop on Computational Modelling of Cancer Biology and Treatments July 2021
Centre de Recherches Mathématiques, Virtual

IMO Workshop 9: Tumor Board Evolution November 2019
Moffitt Cancer Center, Tampa, FL

IMO Workshop 8: Evolutionary Therapy October 2018
Moffitt Cancer Center, Tampa, FL

Joint MBI-NIMBioS-CAMBAM Summer Graduate Program: Connecting Biological Data with Mathematical Models June 2017
Knoxville, TN

CMO Workshop: Viral Dynamics and Cancer August 2015
Oaxaca, Mexico
Contributed Talk: A mathematical analysis of cell cycle dysregulation due to human papillomavirus infections

IMO Workshop IV: Viruses in Cancer November 2014
Moffitt Cancer Center, Tampa, FL
Poster: A quantitative comparison of how high-risk and low-risk human papillomavirus manipulate the epithelial cell cycle

Awards and Scholarships

Moffitt Cancer Center
- SMB Landahl Travel Grant, 2019

University of Utah
- Graduate Research Fellowship: 2016-2017
- Graduate Student Travel Assistance Award: 2016
- SMB Landahl Travel Grant: 2014, 2016
- Teaching Assistantship: 2011-2013, 2015-2016
- NSF Research Training Group (RTG) Grant: Summer 2012, Summer 2013
- NSF Research Training Group (RTG) Fellowship: 2010-2011, 2013-2015

University of North Carolina, Chapel Hill
- Pi Mu Epsilon, Spring 2009

Professional Service

Peer Reviewer
Frontiers in Ecology and Evolution, Journal of Theoretical Biology, Philosophical Transactions of the Royal Society B, Royal Society Open Science

Other Service

Moffitt Cancer Center

- Chair of the Distinguished Lecturer Symposium Committee for the Moffitt Postdoctoral Association — 2019 - 2020
- Member of Moffitt Choir — 2019

University of Utah

- Webmaster for the Mathematical Biology Program — 2014 - 2017
- Secretary/Webmaster for the AWM student chapter — 2013 - 2016
- Organizer for Math Biology t-shirt contest — Spring 2015
- Organizer for AWM/Math Department t-shirt contest — Fall 2014

Science Advocacy

Moffitt Day, Tallahassee, FL — February 2019
Discuss Moffitt's research and mission with Florida Senate and House Representatives.

Community Outreach

B.E.S.T Summer Academy, Virtual — June 2021
A one week program in partnership with Moffitt Healthy Kidz program to teach high school students how to read and present a scientific article.

Light the Night, Tampa, FL — November 2019
An event to raise funds in support of The Leukemia & Lymphoma Society. Volunteered at Moffitt's Women in Science table to share my research on multiple myeloma to event participants.

Technology for Teens Workshop, University of Utah — February 2015

"What is Math?" Day, University of Utah — 2012-2013
Helped organize an event sponsored by the AWM and the University of Utah Mathematics Department to introduce high school and undergraduate students to various topics in mathematics.

Utah FIRST Lego League, Salt Lake City, UT — 2011-2015
A competition where middle-school students use LEGO-based robots that they build and program beforehand to complete a series of tasks based on real-world issues. Volunteered at the qualifying tournament and championship as robot design judge, table setter, practice table manager, and scorekeeper.

Calculus Carnival, University of Utah — November 2010
Volunteered at an event held through the University of Utah Mathematics Department to excite undergraduate students about mathematics through calculus-themed games.

Memberships

- Society for Mathematical Biology (SMB)

Past Memberships

- American Association for Cancer Research (AACR)
- American Mathematical Society (AMS)
- Association for Women in Mathematics (AWM)
- Cancer and Bone Society (CABS)
- Society for Industrial and Applied Mathematics (SIAM)