

Anna K. Miller

MATHEMATICAL MODELER

Moffitt Cancer Center, Tampa, FL

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Research Interests

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

Research Positions

Applied Postdoctoral Fellow

Jan. 2018 - Present

Integrated Mathematical Oncology Department, Moffitt Cancer Center, Tampa, FL

- Modeling environment-mediated drug resistance using hybrid agent-based models.

Education

Ph.D. in Mathematics

May 2018

University of Utah, Salt Lake City

- [Thesis Title](#): Mathematical Modeling of Epithelial Cell Division: Evaluating the Effects of Human Papillomavirus Infection
- [Advisor](#): Frederick R. Adler

M.S. in Mathematics

Aug. 2017

University of Utah, Salt Lake City

B.S. in Mathematics

May 2010

Minor in Hispanic Studies

University of North Carolina, Chapel Hill

Teaching/Mentoring Experience

Society for Mathematical Biology

Summer 2019-2021

Mentorship Program

- Served as a mentor at the annual meeting

Moffitt Cancer Center

Summer 2018-2019

Student Mentor

- 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*. (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*. (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*. (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*. (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*. (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*. (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*. (2013). *Equal contribution.

Conferences

AACR Special Conference: Evolutionary Dynamics in Carcinogenesis and Response to Therapy **Mar. 2022**

Tampa, FL

Poster: Dissecting the role of the bone ecosystem and intrinsic resistance in the evolution of refractory multiple myeloma

Pfizer ECD QSP Group Meeting **Oct. 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 **Aug. 2021**

Virtual

Contributed Talk: Examining environment-mediated drug resistance in multiple myeloma with a hybrid agent based model

PS-ON Annual Investigators Meeting **Aug. 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 **Apr. 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 **Sept. 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 **Aug. 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 **Aug. 2020**

Virtual

Contributed Talk: Modeling the spatiotemporal dynamics of the vicious cycle in multiple myeloma

Moffitt Virtual Scientific Symposium Virtual <i>Contributed Talk:</i> Agent based modeling of the bone ecosystem: creating a biology-driven platform to explore microenvironmental selection in multiple myeloma; Oral Presentation Prize	May 2020
Duke University Mathematical Biology Seminar Durham, NC <i>Invited Talk:</i> Agent based modeling of the bone ecosystem: creating a biology-driven platform to explore microenvironmental selection in multiple myeloma	Feb. 2020
Cancer Biology and Evolution (CBE) Symposium Tampa, FL <i>Poster Highlight:</i> An Agent Based Model of the Bone Microenvironment in Multiple Myeloma	Oct. 2019
Annual Meeting of the Society for Mathematical Biology Montreal, Canada <i>Contributed Talk:</i> Towards a Multiscale Model of the Bone Microenvironment in Multiple Myeloma	July 2019
Moffitt Scientific Symposium Tampa, FL <i>Poster:</i> Towards a Multiscale Model of the Bone Microenvironment in Multiple Myeloma	May 2019
QSP Summit Boston, MA <i>Poster and Lightning Talk:</i> Towards a Multiscale Model of the Bone Microenvironment in Multiple Myeloma; First Place Poster Prize	Apr. 2019
Cancer Evolution & Ecology: Theory and Clinical Practice St. Petersburg, FL	May 2018
IMAG Futures Meeting–Moving Forward with the Multiscale Modeling Consortium Bethesda, MD	Mar. 2018
DeCART: Data Science for the Health Sciences Salt Lake City, UT <i>Invited Talk:</i> Predicting HPV infection dynamics in tissue through mathematical modeling	July 2017
Annual Meeting of the Society for Mathematical Biology Salt Lake City, UT <i>Poster:</i> A Mathematical model of HPV and the disruption of tissue homeostasis; BioFire Poster Prize	July 2017
Annual Meeting of the Society for Mathematical Biology and European Conference for Mathematical and Theoretical Biology Nottingham, United Kingdom <i>Invited Talk:</i> A mathematical model of cell proliferation in epithelial tissue due to human papillomavirus infection	July 2016
HPV-U01 Annual Meeting University of Michigan, Ann Arbor, MI <i>Invited Talk:</i> A mathematical model of cell proliferation in epithelial tissue due to human papillomavirus infection	May 2016
AMS Spring Western Sectional Meeting Salt Lake City, UT <i>Organizer:</i> Special Session on Structure and Emergent Properties of Biological Networks	Apr. 2016
Annual Meeting of the Society for Mathematical Biology and Japanese Society for Mathematical Biology Osaka, Japan <i>Contributed Talk:</i> A quantitative comparison of high-risk and low-risk human papillomavirus manipulation of the epithelial cell cycle	July 2014
Biophysical Society 57th Annual Meeting Philadelphia, PA <i>Poster:</i> Steps within the assembly of HIV-1	Feb. 2013

Workshops

Quantitative Systems Pharmacology Approaches to Problems in the Pharmaceutical Industry The Fields Institute, Virtual	Aug. 2021
Workshop on Computational Modelling of Cancer Biology and Treatments Centre de Recherches Mathématiques, Virtual	July 2021
IMO Workshop 9: Tumor Board Evolution Moffitt Cancer Center, Tampa, FL	Nov. 2019
IMO Workshop 8: Evolutionary Therapy Moffitt Cancer Center, Tampa, FL	Oct. 2018
Joint MBI-NIMBioS-CAMBAM Summer Graduate Program: Connecting Biological Data with Mathematical Models Knoxville, TN	June 2017
CMO Workshop: Viral Dynamics and Cancer Oaxaca, Mexico <i>Contributed Talk:</i> A mathematical analysis of cell cycle dysregulation due to human papillomavirus infections	Aug. 2015
IMO Workshop IV: Viruses in Cancer Moffitt Cancer Center, Tampa, FL <i>Poster:</i> A quantitative comparison of how high-risk and low-risk human papillomavirus manipulate the epithelial cell cycle	Nov. 2014

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, 2021**

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

Feb. 2019

Tallahassee, FL

- Discuss Moffitt's research and mission with Florida Senate and House Representatives.

Community Outreach

Brain Expansions Scholastic Training (BEST) Summer Academy

June 2021

Virtual

- 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

Nov. 2019

Tampa, FL

- 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

Feb. 2015

University of Utah

"What is Math?" Day

2012-2013

University of Utah

- 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

2011-2015

Salt Lake City, UT

- 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.

Professional Affiliations

Current Memberships

- American Association for Cancer Research (AACR)
- Society for Mathematical Biology (SMB)

Past Memberships

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