Anne Talkington
Department of Biomedical Engineering
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EDUCATION

University of North Carolina, Chapel Hill, NC
PhD in Bioinformatics and Computational Biology, 2021
MS in Applied Mathematics, 2019
Certificate in Cardiovascular Science
Certificate in Data Science

Duke University, Durham, NC, 2015
Bachelor of Science with Distinction in Mathematics; Bachelor of Arts in Biology
Magna Cum Laude; Phi Beta Kappa

RESEARCH EXPERIENCE

Post-Doctoral Research at the University of Virginia, Charlottesville, VA
Advisor: Sepideh Dolatshahi
- Project: Modeling the role of intercellular communication in the melanoma tumor microenvironment

Graduate Research at the University of North Carolina at Chapel Hill, Chapel Hill, NC
PhD Advisors: Greg Forest and Sam Lai
- Dissertation: "A Physiologically-Based, Pharmacokinetic Model for the Clearance of PEGylated Nanomedicines"

MS Advisors: Kathleen Caron and Laura Miller
- Thesis: "Dermal lymphatic capillaries do not obey Murray's Law"

Post-Baccalaureate Research at Duke University, Durham, NC
Advisor: Rick Durrett
- Project: Modeling the success or failure of immunotherapy as a cancer treatment

Mathematical Biology Research Experience for Undergraduates at Duke University, Durham, NC
(*Independent research project advised by Rick Durrett*, 2013-2015)
- Project: Investigating a mathematical, mechanistic model for cancerous tumors and immune response, specifically during and after treatment

McShea Lab at Duke University, Durham, NC (*Research Assistant*, 2012-2015)
- Project: Upper-directed systems modeling for inter-species interactions of migrating populations

Biotechnology Center of UNC Pembroke, Pembroke, NC (*Research Assistant,* 2011-2013)
- Project: Creating a calculus-based analytical method to determine microbial population growth rate

PUBLICATIONS

12. Zhongbo Li, Limei Shen, Alice Ma, **Anne Talkington**, Zibo Li, Andrew C. Nyborg, Scott Bowers, Brian LaMoreaux, Eric W. Livingston, Jonathan E. Frank, Hong Yuan, Samuel K. Lai (2022), "Reformulation of Krystexxa with high MW polyethylene glycol effectively reduces PEG-immunogenicity and restores prolonged circulation in mouse," *submitted*

11. Cecily Wolfe, Yayi Feng, David Chen, Edwin Purcell, **Anne Talkington**, Sepideh Dolatshahi, Heman Shakeri (2022), "GeoTyper: Automated Pipeline from Raw scRNA-Seq Data to Cell Type Identification," *Proceedings of the 2022 Systems and Information Engineering Design Symposium*, 2022 June, pp. 223-228. DOI 10.1109/SIEDS55548.2022.9799321.

10. **Anne M. Talkington**, Reema B. Davis, Nicholas C. Datto, Emma R. Goodwin, Laura A. Miller, and Kathleen M. Caron (2022), "Dermal lymphatic capillaries do not obey Murray's Law," *Frontiers in Cardiovascular Medicine*, Vol. 9. DOI 10.3389/fcvm.2022.840305.

9. **Anne M. Talkington**, Morgan D. McSweeney, Timothy Wessler, Marielle K. Rath, Zibo Li, Tao Zhang, Hong Yuan, Jonathan E. Frank, M. Gregory Forest, Yanguang Cao, Samuel K. Lai (2022), "A PBPK model recapitulates early kinetics of anti-PEG antibody-mediated clearance of PEG-liposomes," *Journal of Controlled Release*, Vol. 343, pp. 518-527. DOI 10.1016/j.jconrel.2022.01.022.

8. **Anne M. Talkington**, Timothy Wessler, Samuel K. Lai, Yanguang Cao, M. Gregory Forest (2021), "Experimental data and PBPK modeling quantify antibody interference in PEGylated drug carrier delivery," *Bulletin of Mathematical Biology*, Vol. 83. DOI 10.1007/s11538-021-00950-z.
Early Career Feature, Society for Mathematical Biology Newsletter, Spring 2022

7. **Anne M. Talkington**, Morgan D. McSweeney, Tao Zhang, Zibo Li, Andrew C. Nyborg, Brian LaMoreaux, Eric W. Livingston, Jonathan E. Frank, Hong Yuan, Samuel K. Lai (2021), "High molecular weight polyethylene glycol restores prolonged circulation of pegloticase in mice with anti-PEG antibodies," *Journal of Controlled Release*, Vol. 338, pp. 804-812. DOI 10.1016/j.jconrel.2021.08.05.

6. Michael Senter, Dylan Ray, Christopher Strickland, Steven Thomas, **Anne Talkington**, Laura Miller, Nicholas Battista (2020), "A Semi-Automated Finite Difference Mesh Creation Method for Use with IB2d," *Bioinspiration and Biomimetics*, Vol. 16 (1). DOI 10.1088/1748-3190/ababb0.

5. **Anne Talkington**, Claudia Dantoin, Rick Durrett (2018), "Ordinary differential equation models for adoptive immunotherapy," *Bulletin of Mathematical Biology*. DOI 10.1007/s11538-017-0263-8.
Top 10 Most Downloaded Articles in Bulletin of Mathematical Biology (2018)

4. **Anne Talkington** (2017), "Undergraduate research highlight: Modeling movement behavior among interacting species," *Women in Mathematical Biology*. Association for Women in Mathematics Series, Vol.8. DOI 10.1007/978-3-319-60304-9_12.

3. **Anne Talkington**, Rick Durrett (2015), "Estimating tumor growth rates in vivo," *Bulletin of Mathematical Biology*. DOI 10.1007/s11538-015-0110-8.

2. **Anne M. Talkington**, Floyd L. Inman III, and Leonard D. Holmes (2013), "A novel method for determining microbial kinetics," *Journal of Life Sciences*, Vol.7, No.8, pp.787-790.

1. **Anne Talkington**, Floyd Inman III, Leonard D. Holmes, and Guo Wei (2013), "An extension to a logistic model for microbial kinetics," *Advances in Systems Science and Applications*, Vol.13, No.1, pp.80-99.

MANUSCRIPTS IN PREPARATION

- "Network inference suggests mechanisms of resistance to immune checkpoint blockade in non-responding melanoma patients," *in preparation*
  Team members*: **Anne M. Talkington**, Heman Shakeri, Sepideh Dolatshahi
  *List of authors to be finalized upon manuscript submission

- Joshua C. M. Ferey, Robert W. Barnes, **Anne M. Talkington**, Sepideh Dolatshahi (2022), "Computational Approaches to Guide Development of Novel Cancer Immunotherapies Harnessing Intercellular Interactions," *in preparation*

- Zhongbo Li, Alice Ma, **Anne Talkington**, Samuel K Lai (2022), "Development of quantitative anti-PEG ELISAs for characterizing pre-existing anti-PEG immunity in patients with alpha-gal allergy," *in preparation*

- Limei Shen, Zhongbo Li, Nicole Massoud, **Anne Talkington**, Alice Ma, Steven Shipley, Samuel K Lai (2022), "Free PEG infusion mitigates PEG-mediated anaphylaxis in swine," *in preparation*

FELLOWSHIPS AND GRANTS

- Selected for *Immunology NIH T32 Training Program*, University of Virginia (2021)
- P.E.O. (Philanthropic Educational Organization) Scholar Award ($15,000) (2020)

- Selected for *Integrative Vascular Biology NIH T32 Training Program*, UNC Chapel Hill (2017)
- *Graduate Research Fellowship Program*, National Science Foundation ($138,000) (2016)

Travel Awards:
- UNC Graduate Student Transportation Grant ($1,000) (2019)
- Biology and Medicine through Mathematics NSF/ SIAM Travel Funding ($500) (2018, 2019)
- *Landahl-Busenberg Grant*, Society for Mathematical Biology ($750) (2018)

CONFERENCE PRESENTATIONS

- "Perturbations of cellular interaction networks in the melanoma tumor microenvironment as a result of immune checkpoint blockade," Systems Approaches to Cancer Biology, Marine Biological Laboratory, Woods Hole, MA, selected oral presentation (2022)
- "Network Inference Approaches Identify a Role for Glycosylation-modified Immunosuppressive Cellular Interactions in the Tumor Microenvironment," Southeastern Immunology Symposium, Duke University, poster presentation (2022)
- "Assessing treatment-resistant cancers through cellular interaction networks"
  - Immunology Research Day, University of Virginia, poster presentation (2022)
  - Postdoctoral Research Symposium, University of Virginia, oral presentation (2021)
- "A PBPK model for clearance of PEGylated nanomedicines"
  - Society for Mathematical Biology Annual Meeting, Heidelberg University, oral presentation and session chair (2020)
  - Biology and Medicine through Mathematics Conference, Virginia Commonwealth University, oral presentation (2020)
- "Dermal Lymphatic Capillaries Do Not Obey Murray's Law"
  - Integrative Vascular Biology Annual Symposium, UNC Chapel Hill, oral presentation (2020)
  - Society for Mathematical Biology Annual Meeting, University of Montreal, poster presentation (2019)
  - Biology and Medicine through Mathematics Conference, Virginia Commonwealth University, oral presentation (2019)
  - Integrative Vascular Biology Annual Symposium, UNC Chapel Hill, poster presentation (2019)
- "Optimal Flow Patterns in Branching Lymphatic Vessels"
  - Society for Mathematical Biology Annual Meeting, University of Sydney, oral presentation and session chair (2018)
  - Biology and Medicine through Mathematics Conference, Virginia Commonwealth University, poster presentation (2018)
  - Integrative Vascular Biology Annual Symposium, UNC Chapel Hill, poster presentation (2018)
- "Optimizing Flow in Branching Lymphatic Vessels"
  - Society for Mathematical Biology Annual Meeting, University of Utah, poster presentation (2017)
  - University of Utah Mathematical Biology Alumni Conference, University of Utah, poster presentation (2017)
  - Biology and Medicine through Mathematics Conference, Virginia Commonwealth University, poster presentation (2017)
  - Sixth Annual Winter Workshop on Neuromechanics and Dynamics of Locomotion, Tulane University, poster presentation (2017)
  - Regional Society for Integrative and Comparative Biology Meeting (rSICB), Virginia Tech, oral presentation (2017)
  - Regional Society for Integrative and Comparative Biology Meeting (rSICB), Duke University, oral presentation (2016)

- o Southeastern Conference for Undergraduate Women in Mathematics, Duke University, oral presentation and graduate student panelist (2016)
- "Modeling the Dynamics of Cancerous Tumors in Vivo," Southeastern Conference for Undergraduate Women in Mathematics, Duke University, oral presentation and conference planning committee (2015)
- "Estimating Tumor Growth Rates in Vivo," Southeastern Conference for Undergraduate Women in Mathematics, Clemson University, oral presentation (2014)
- "Modeling Interactions among Migrating Species," Mathematical Association of America Southeast Sectional Meeting, Tennessee Tech University, oral presentation (2014)
- "A Mechanistic Model for Tumor Growth and Response to Cancer Treatment"
  - o Southeastern Conference for Undergraduate Women in Mathematics, Clemson University, oral presentation (2013)
  - o Mathematical Biology Research Experience for Undergraduates Capstone Conference, Mathematical Biosciences Institute, Ohio State University, poster presentation (2013)
- "A Novel Approach for Determining Microbial Kinetics," Women in Science and Engineering Research Symposium, Duke University, poster presentation (2012)
- "Utilization of the Maclaurin Series as a Novel Approach to Determine Microbial Kinetics,"
  - o Society for Industrial Microbiology and Biotechnology (SIMB), Washington, D.C., poster presentation (2012)
  - o North Carolina Regional American Society for Microbiology Meeting, Research Triangle Park, poster presentation (2012)
- "An Analytical Approach to Determining Microbial Population Growth," North Carolina Student Academy of Science, North Carolina School of Science and Mathematics, oral presentation (2012)

AWARDS AND HONORS
- The Global Undergraduate Awards program, Highly Commended Entrant (top 10% of undergraduate research papers internationally) (2016)
- COMAP Mathematical Contest in Modeling, Meritorious recognition (top ~10% of research papers internationally) (2013, 2014, 2015)
- Dean's List with Distinction (3 semesters, Duke University); Dean's List (4 semesters, Duke University)
- Duke University Faculty Scholar Award Finalist (Department of Biology Nominee; Spring 2015)

TEACHING EXPERIENCE
*Denotes graduate-level course

University of North Carolina at Chapel Hill
Teaching Assistant:

Math 891* – Physiologically Based, Pharmacokinetic (PBPK) Modeling Approaches to Drug Delivery, Spring 2020
  Assisted with course design, curriculum preparation, instruction, and grading
BCB 715* – Modeling Signaling and Regulatory Networks, Fall 2017
  Served as primary point of contact for students, responsible for preparing and delivering set of lectures and grading
Private tutoring: Single-variable and Multivariable Calculus, Ordinary Differential Equations, Pre-Calculus, Introductory Statistics
  Provided individualized instruction and designed course review materials

Duke University
Teaching Assistant:
Math 106L – Laboratory Calculus and Functions II, Fall 2014

Math 111L – Laboratory Calculus I, Fall 2013

Math 112L – Laboratory Calculus II, Spring 2014/ Spring 2016

Math 353 – Ordinary and Partial Differential Equations, Spring/ Fall 2015

Led recitation sections of ~20 students, delivered short lectures reviewing primary course materials, led guided problem-solving, assisted with grading

Private tutoring: Single-variable and Multivariable Calculus, Ordinary Differential Equations, Linear Algebra
Provided individualized instruction and designed course review materials

OTHER RELEVANT WORK EXPERIENCE

Data Analytics Intern at Lineage Logistics (2015)
- Constructed a predictive model for fishing success to assist in resource allocation

SERVICE ACTIVITIES

- Alumni Admissions Committee, Duke University (2017-2022)
- Co-taught math modeling workshop through the UNC Mathematics Department for undergraduate and high school students in preparation for the international COMAP competition (2020)
- UNC Shadow-A-Scientist graduate mentor (2020)
- Carolina Women in STEM program graduate panelist (2019-2020)
- UNC Young Innovators Program graduate mentor (2019)
- UNC Graduate-Undergraduate Networking Session; planning committee, panelist (2019)
- Science Fair Judge, NC Region 4; Mathematics, Physics, and Engineering (2018)
- Speaker Coordinator, UNC Integrative Vascular Biology Symposium Committee (2017-2018)
- Duke University Math Union (2012-2015); contribute to union-sponsored events (Duke University Math Meet), Guest Lecture Coordinator (2013-2014), Math Meet Coordinator (2014-2015), Vice President (2015)
- Duke University Mathematics Women's Mentoring Network (2012-2015); mentor, student-faculty liaison
- Society for Physics Students (2012-2015); coordinate events, Secretary/ Social Chair
- Duke University Physics outreach for Durham County Schools – assisted with demonstrations (2012-2013)
- Volunteer Tutor for FEMMES (Females Excelling More in Math, Engineering, and Science) – assisted with instruction and experiments (2012)

REFEREE SERVICE

Mathematical Biosciences, PLoS ONE, Natural Hazards, IET Systems Biology

STUDENTS MENTORED

- David Chen, Celine Feng, Edwin Purcell, Cecily Wolfe, Master's in Data Science Capstone Team (hosted by Shakeri/ Dolatshahi Labs), University of Virginia
- Zhongbo Li, graduate student (Lai Lab), University of North Carolina at Chapel Hill
- Marshall Fritz, graduate rotation student (Lai Lab), University of North Carolina at Chapel Hill
- Marielle Rath, high school student (Lai Lab), Young Innovators Program participant
- Emma Goodwin, undergraduate student (Miller/ Caron Labs), University of North Carolina at Chapel Hill
- Hannah Frediani, undergraduate student (Miller Lab), University of North Carolina at Chapel Hill
- Jack Cannon, undergraduate student (Miller Lab), University of Chicago
- Nicholas Datto (Caron Lab), high school student

PROFESSIONAL AFFILIATIONS

- Society for Mathematical Biology (Oncology and Immunology subgroups)

- Society for Industrial and Applied Mathematics
- Association for Women in Mathematics

COMPUTATIONAL SKILLS

MatLab, Mathematica, Python, R, Unix (LSF, SLURM), PMOD