James Greene

CONTACT INFORMATION

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RESEARCH INTERESTS

Applications of Mathematics to Biological and Medical Science, Evolution of Cancer, Drug Resistance in Chemotherapy, Control and Optimal Control Theory, Ordinary, Partial, and Integro- Differential Equations, Applied Probability and Stochastic Processes, Systems Biology, Synthetic Biological Circuits

EMPLOYMENT

Hill Assistant Professor, Rutgers University, NJ, USA — Fall 2015-present
Mentor: Eduardo Sontag

EDUCATION

Ph.D., Mathematics — Spring 2015
University of Maryland, College Park, MD, USA
Advisor: Prof. Doron Levy

M.S., Mathematics — May 2011
University of Maryland, College Park, MD, USA
Advisor: Prof. Doron Levy

B.S., Mathematics, *Magna Cum Laude* — May 2008
B.S., Physics, *Magna Cum Laude* — May 2008
The Pennsylvania State University, University Park, PA, USA

SKILLS

Proficient in Python, Java, MATLAB, C/C++, Mathematica, Maple, HTML/CSS, LaTeX, XPP, NetLogo

PUBLICATIONS

J. Greene, D. Agrawal, and E. Sontag. *Dynamics of Three-Body Chemical Reaction Networks. In preparation, available on arXiv October 2018.*

J. Greene, A. Silva, and E. Sontag. *The Dynamics of the Proliferation Index in Mixture. In preparation.*

J. Greene, C. Sanchez-Tapia, and E. Sontag. *Mathematical Details on a Cancer Resistance Model. In preparation, available on arXiv October 2018.*

J. Greene, C. Sanchez-Tapia, and E. Sontag. *Control Structures of Drug Resistance in Cancer Chemotherapy.* Proceedings of IEEE Conference on Decision and Control, Dec. 2018.

J. Greene, J. Gevertz, and E. Sontag. *A Mathematical Approach to Different Spontaneous and Induced Evolution to Drug Resistance During Cancer Treatment. Submitted.*

V. Nagaraj, **J. Greene,** A. Sengupta, and E. Sontag. *Translation Inhibition and Resource Balance in the TX-TL Cell-Free Gene Expression System.* Synthetic Biology, 2 (1): ysx005 (2017)

A. Silva, M. C. Silva, M. B. Meads, T. Jacobson, A. Distler, P. Sudalagunta, A. Collins, J. Song, D. Chen, L. Chen, C. Cubitt, R. Baz, L. Perez, R. Gatenby, W. Dalton, **J. Greene**, E. Sontag, R. Gillies, D. Rebatchouk, K. H. Shain. *Prediction of Clinical Response in Multiple Myeloma Patients through Ex Vivo and Computational Models.* Cancer Research, 77 (12): 3336-3351 (2017).

J. Greene, D. Levy, S.P. Horrid, M. Gottesman, and O. Lavi. *Mathematical Modeling Reveals that Changes to Local Cell Density Dynamically Modulate Baseline Variations in Cell Growth and Drug Response.* Cancer Research, 76: 2882-2890 (2016).

J. Greene, D. Levy, K. L. Fung, P. Souza, M. Gottesman , and O. Lavi. *Modeling Intrinsic Heterogeneity and Growth of Cancer.* Journal of Theoretical Biology, 367: 262-277 (2015).

O. Lavi, **J. Greene,** D. Levy, and M. Gottesman. *Simplifying the Complexity of Resistance Heterogeneity in Metastatic Cancer.* Trends in Molecular Medicine, 20: 129-136 (2014).

J. Greene, O. Lavi, M. Gottesman, and D. Levy. *The Impact of Cell Density and Mutations in a Model of Multidrug Resistance in Solid Tumors.* Bulletin of Mathematical Biology, 74: 627-653 (2014).

O. Lavi, **J. Greene,** D. Levy, and M. Gottesman. *The Role of Cell Density and Intratumoral Heterogeneity in Multidrug Resistance.* Cancer Research, 73: 7168-7175 (2013).

SEMINAR AND CONFERENCE PRESENTATIONS

Presentation. *The Impact of Induced Drug Resistance in Cancer Chemotherapy* — January 2019
Joint Mathematics Meetings
Baltimore, MD

Presentation. *Geometric Control of an Induced Model of Drug Resistance* — November 2018
Kolchin Seminar in Differential Algebra
CUNY, NY

Presentation. *Control Structures in Cancer Chemotherapy* — July 2018
SMB Annual Meeting
Sydney, Australia

Presentation. *Induced Drug Resistance in Cancer Chemotherapy: Identifiability and Control* — June 2018
Integrative Cell Models for Disease Intervention
Banff, Canada

Presentation. *Some Applications of Mathematics to Cancer* — October 2017
Postdoc Colloquium
New Brunswick, NJ

Presentation. *The Role of Induced Drug Resistance in Cancer Chemotherapy* — July 2017
Mathematical Models in Biology and Medicine
Vienna, Austria

Presentation. *Tumor Heterogeneity and its Implications in Drug Resistance* — July 2016

SIAM Life Sciences Conference
Boston, MA

Presentation. *Mathematical Models of Drug Resistance and Tumor Heterogeneity* — March 2016
UPenn Math Bio Seminar
Philadelphia, PA

Presentation. *The Cell-Cycle and Drug Resistance: A Spatial Mechanism* — January 2015
Joint Mathematics Meetings
San Antonio, TX

Poster. *Modeling Intrinsic Heterogeneity and Growth of Cancer* — September 2014
Workshop 1: Ecology and Evolution of Cancer
MBI Emphasis Year on Cancer and Its Environment
Ohio State University, OH

Poster. *The Mathematics of Stem Cells, Drug Resistance, and Cancer* — May 2014
CNSF Annual Exhibition on Capitol Hill
Washington, DC

Presentation. *Modeling Drug Resistance in Metastatic Cancer* — January 2014
UMD-NCI Cancer Technology and Epidemiology Symposium
College Park, MD

Poster. *The Effects of Cellular Density and Mutations on a Mathematical Model of Multidrug Resistance* — August 2013
MBI Workshop for Young Researchers in Mathematical Biology
Columbus, OH

Presentation. *Drug Resistance and Cancer: A Structured Population Approach* — May 2013
Monroe-Martin Talks
College Park, MD

Presentation. *The Effects of Spatial Heterogeneity on the Spread of Disease* — May 2012
MBI Project Talk
Columbus, OH

Presentation. *An Omnivore Brings Chaos.* — June 2008
Joint Mathematics Meeting
San Diego, CA.

Poster. *Scavenger Models and Chaos* — June 2008
Joint Mathematics Meeting
San Diego, CA

Presentation. *Scavenger Models and Chaos* — November 2007
Conference on Undergraduate Research in Mathematics
University Park, PA

CONFERENCES AND WORKSHOPS ATTENDED

Northeastern University 2018 Summer Systems Biology Day — August 2018
Boston, MA

Workshop on Mathematical Methods in Cancer Evolution and Heterogeneity — June 2017
Columbia University Center for Topology of Cancer Evolution and Heterogeneity

The Governor's Conference on Effective Partnering in Cancer Research — June 2017
The Interface of Clinical and Translational Science
Institute for Advanced Study, Princeton, NJ

Frontiers in Mathematical Oncology: Young Investigators Conference — April 2017
University of Maryland, MD

Joshua Lederberg - John von Neumann Symposium: Towards Quantitative Biology — December 2015
Institute for Advanced Study, Princeton, NJ

Frontiers in Mathematical Oncology: Young Investigators Conference — May 2014
University of Maryland, MD

Modern Perspectives in Applied Mathematics: Theory and Numerics of PDEs — May 2014
Bethesda, MD

Physical Sciences and Oncology Symposium — April 2014
NIH Campus, Bethesda, MD

PIMS IGTC Mathematical Biology Summer School: The Mathematics Behind Biological Invasions — May 2013
University of Alberta, Canada

- Lectures and exercises on topics including reaction-diffusion equations, optimal control, and dynamical systems.

MBI Summer Graduate School on Stochastics Applied to Biological Systems — May 2012
Ohio State University, OH

- Lectures and exercises on topics including stochastic differential equations, biological fluids, Markov chains, Bayesian analysis, and MCMC.

Frontiers in Mathematical Biology: Young Investigators Conference — March 2012
University of Maryland, MD

ACADEMIC EXPERIENCE

Undergraduate Thesis Advisor — Fall 2017-present
Rutgers University, NJ
Advised advanced undergraduate students on honors thesis topics related to mathematical biology

- Samantha Sun (graduating Spring 2019): *Using Mathematics to Understand the Combined Effects of Imatinib and Interferon on the Treatment of Chronic Myeloid Leukemia*
- Daniel Greenfield (Biophysics at Harvard): *Application of an Automated Virtual Screening Pipeline for Drug Discovery*

Immunology and Cancer RIT Organizer Fall 2011-Fall 2014
University of Maryland, MD
- Co-Organizer. Research Interaction Team (RIT) on the topic of mathematical modeling of cancer immune interactions.

UMD Directed Reading Program Spring 2012-Spring 2015
University of Maryland, MD
- Mentor. Directed undergraduate students on advanced mathematical topics.

SERVICE

Reviewer: Bulletin of Mathematical Biology, Journal of Theoretical Biology, Multidisciplinary Digital Publishing Institute (MDPI)

TEACHING EXPERIENCE

Instructor, Rutgers University
- *Advanced Linear Algebra* Fall 2018
- *Mathematics of Cancer*, **Course creator** Spring 2018
- *Elementary Differential Equations* Fall 2017
- *Dynamical Models in Biology* Fall 2017
- *Mathematics of Cancer*, **Course creator** Spring 2017
- *Elementary Differential Equations* Fall 2016
- *Dynamical Models in Biology* Fall 2016
- *Advanced Calculus for Engineering* Spring 2016
- *Dynamical Models in Biology* Spring 2016
- *Dynamical Models in Biology* Fall 2015

Teaching Assistant, University of Maryland
- *Introductory Differential Equations*, Lecturer/TA Spring 2015
- *Calculus II*, TA Spring 2012
- *Introductory Differential Equations*, Grader Summer 2011
- *Calculus II*, TA Spring 2011
- *Calculus I*, TA Fall 2010
- *Linear Algebra for Scientists and Engineers*, Course Chair Summer 2010
- *Linear Algebra for Scientists and Engineers*, TA Spring 2010
- *Calculus III*, TA Fall 2009
- *Linear Algebra for Scientists and Engineers*, Grader Summer 2009
- *Real Analysis*, Grader Spring 2009
- *Introduction to Ordinary Differential Equations*, TA Fall 2008

HONORS, AWARDS, GRANTS, AND SCHOLARSHIPS

Harold H. Martin Postdoctoral Fellowship September 2015-present
Department of Mathematics, Rutgers University

NCI/UMD Partnership in Cancer Technology Fellowship September 2012-Fall 2014
National Institutes of Health

Research Assistantship Fall 2012-Spring 2012
Prof. Doron Levy, University of Maryland

Teaching Assistantship Fall 2008-Fall 2014
Mathematics Department, University of Maryland

Jabir Shipley Memorial Award for Outstanding Achievements in Mathematics Spring 2007
Department of Mathematics, The Pennsylvania State University

Faculty Scholarship for Academic Excellence Fall 2007
The Pennsylvania State University Senate

National Society of Collegiate Scholars

Phi Beta Kappa Society

PROFESSIONAL ORGANIZATIONS

Society for Mathematical Biology
Society for Industrial and Applied Mathematics
American Mathematical Society

OTHER RESEARCH EXPERIENCE

Research Assistant August 2006-June 2008
Pritchard Fluid Mechanics Laboratory, University Park, PA
Research project included:

- Undertook experiments in a wave tank to test the nonlinear Schrodinger equation as a model for water waves
- Analyzed collected data from tank experiments by asymptotic analysis of the Schrodinger equation, design of computer code to find functional fits of the data, and analysis of output from the code
- Determined data lacked characteristics of Schrodinger waves and identified source of discrepancy
- Designed computer programs to fit data onto wave paddles used to create water waves that matched the data

Research Assistant Summer 2007
Behrend College Mathematical Biology REU, Erie, PA
Research project included:

- Performed a basic analysis on a three-species population model, including a classical fixed point analysis
- Studied the Hopf bifurcations of the model for various parameter values
- Discovered and analyzed the chaotic attractor in the system
- Contributed theoretical and numerical analysis to *Period Doubling Cascades in a Predator-Prey Model with a Scavenger,* SIAM Review, 55(3): 523-554 (2013).