

PERSONAL INFORMATION **Jeremy D Harris**

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WORK EXPERIENCE

June 2020 – present

Postdoctoral Fellow Researcher in Weitz Group

Department of Biological Sciences, Georgia Tech

- Advisor: Joshua Weitz, PhD, Associate Professor
- Aim: We aim to develop and analyze mathematical models of virus-microbe dynamics. We aim to better understand the long-term interactions of viruses and their hosts, particularly in the context of non-lytic modes of infection such as lysogeny.

August 2017 – May 2020

Postdoctoral Fellow Researcher in Koelle Research Group

Department of Biology, Emory University

- Advisor: Katia Koelle, PhD, Associate Professor
- Developed mathematical models of influenza virus. In collaboration with experimental virologists, we studied the effects of multiplicity of infection (MOI) on influenza viral infection outcomes in cell culture. We also modeled a serial passage study in which varying MOIs of wild-type and defective interfering particles gave rise to cycling dynamics. Lastly, we developed a within-host stochastic exponential growth with mutations model to estimate between-host bottleneck sizes based on the number of de novo variants in recipient hosts.

EDUCATION

2017 Ph.D. in Mathematics

University of Pittsburgh, Pittsburgh, PA

Advisor: Bard Ermentrout, PhD, Distinguished University Professor

- Thesis: "Analysis of a spatially-distributed Wilson-Cowan model of cortex"

2011 B.S. in Mathematics, minor in Bioengineering

University of Pittsburgh, Pittsburgh, PA

- Honors College, Graduated Summa Cum Laude

PUBLICATIONS

In preparation.

- Harris, J.D., Park, S.W., Dushoff, J., Weitz J.S. (2020). "Modeling asymptomatic transmission in COVID-19." (in preparation, anticipated date of submission: July 2021)
- Harris, J.D.*, Martin, B.E.*, Koelle, K.V., and Brooke, C.B. (2020). "Influenza virus population cycles emerge from collections of variably responding cells." *authors contributed equally. (in preparation, anticipated date of submission: Sept. 2021)

Published.

- Martin, B.E.*, Harris, J.D.* et al. (2020). "Cellular co-infection can modulate the efficiency of influenza A virus production and shape the interferon response." PLoS pathogens 16.10: e1008974. *authors contributed equally <https://doi.org/10.1371/journal.ppat.1008974>
- Harris, J.D. and Ermentrout, G.B. (2018). "Traveling waves in a spatially-distributed Wilson-Cowan model of cortex: From fronts to pulses." Physica D: Nonlinear Phenomena, 369, 30-46. <https://doi.org/10.1016/j.physd.2017.12.011>

- Ali, R., Harris, J.D.*, and Ermentrout, G.B. (2016). "Pattern formation in oscillatory media without lateral inhibition." *Physical Review E*, 94(1), 012412. *corresponding author
<https://doi.org/10.1103/PhysRevE.94.012412>
- Harris, J.D. and Ermentrout, G.B. (2015). "Bifurcations in the Wilson–Cowan equations with nonsmooth firing rate." *SIAM Journal on Applied Dynamical Systems*, 14(1), 43-72. <https://doi.org/10.1137/140977953>

PRESENTATIONS

2014 – present Talks & Posters (external)

While in Weitz lab:

- Invited speaker – "Individual-level differences in symptomatic and asymptomatic transmission shape population-level dynamics of SARS-CoV-2 outbreaks." Virtual talk for University of Pennsylvania Math Bio seminar (Feb. 1, 2022)
- 2-minute Rapid Talk ([poster](#)) – "Modeling asymptomatic transmission in COVID-19." [MIDAS 2021](#) (May 10-13)
- Invited speaker – "Modeling asymptomatic transmission in COVID-19." Virtual talk for University of Florida Math Bio seminar (Feb. 4, 2021)
- Poster presentation – "Modeling asymptomatic transmission in COVID-19." [Student Conference on COVID-19 modeling](#) (May 28-29, 2021)
- Invited speaker – "Modeling asymptomatic transmission in COVID-19." Virtual talk for University of Pittsburgh Math Bio seminar (Nov. 19, 2020)

While in Koelle lab:

- Conference talk – "Estimating transmission bottleneck sizes from viral variants unique to recipient hosts." *Epidemics Conference 2019* (Dec. 3-6, 2019)
- Invited speaker – "Cellular co-infection increases viral production but the constituents of the output depend on frequencies of the input." *Kennesaw State University, Applied Math seminar* (Nov. 15, 2019)
- Invited speaker – "How do defective interfering particles impact influenza virus dynamics?" *University of Pittsburgh, Center for Vaccine Research* (April 16, 2019)
- Discussion moderator – summarized conference talks/posters and facilitated "Big picture" discussion on the future of quantitative biology. *A TMLS-sponsored conference at Emory* (Jan. 16-18, 2019)
- Poster presentation – "Complex viral dynamics emerge in vitro from collections of heterogeneously-responding infected cells." *Evolution of Complex Life at Georgia Tech* (May 15-17, 2019)

While in graduate school:

- Conference talk – "Traveling waves in a (nonsmooth) neural firing rate model." *SIAM 2017 Annual Meeting* (Pittsburgh, PA, July 10-14, 2017)
- Conference talk – "Patterns and waves in a spatially-extended neural field model." *SIAM 2017 Conference on Applications of Dynamical Systems* (Snowbird, Utah, May 21-25, 2017)
- Conference talk – "Travelling fronts and pulses in a nonsmooth neural mass model." *SIAM 2015 Conference on Applications of Dynamical Systems* (Snowbird, Utah, May 17-21, 2015)
- Conference talk – "The Wilson-Cowan equations with nonsmooth firing rate." (George Mason University, March 20-21, 2015)
- Conference talk – "Bifurcation analysis of the Wilson-Cowan equations with nonsmooth firing rate function." *IEEE International Meeting on Analysis and Applications of Nonsmooth Systems* (Como, Italy, August 10-12, 2014)

2011 – present **Seminar Presentations (internal)**

- Presented, "Modeling asymptomatic transmission in COVID-19." Complex microbial dynamics and infections seminar (Oct. 9, 2020)
- Presented, "Data literacy in the sciences." Academic Learning Community on data literacy, Emory (March 31, 2020)
- Presented Rubin et al., "Revealing neural correlates of behavior without behavioral measurements." BioRxiv (2019). Theoretical Biophysics seminar, Emory (Oct. 21, 2019)
- Presented Shoval et al., "Evolutionary Trade-Offs, Pareto Optimality, and the Geometry of Phenotype Space." Science (2012). Theoretical Biophysics seminar, Emory (Feb. 18, 2019)
- Presented on current methods of estimating transmission bottlenecks. Koelle lab meeting, Emory (Feb. 11, 2019)
- Presented Allesina and Levine, "A competitive network theory of species diversity." PNAS (2011). Theoretical Biophysics seminar, Emory (Oct. 2017)
- Presented "The community ecology of influenza A defective interfering particles." Ecology and Evolution seminar, Emory (Oct. 2017)
- Presented "Pattern formation in the Wilson-Cowan equations." Applied Math seminar, Pitt (September 25, 2015)
- Presented on "Bifurcations of piecewise smooth flows." Colombo et al., Physica D: Nonlinear Phenomena (2012). Math Bio seminar, Pitt (Sept. 12 & 17, 2015)
- Presented an introduction to rigidity in the tensegrity model – In preparation for the guest speaker, R. Connelly, as part of a themed semester on networks. Math Bio seminar, Pitt (Sept. 17, 2014)
- Presented on "Iterated Prisoner's Dilemma contains strategies that dominate any evolutionary opponent." Press and Dyson, PNAS (2012). Math Bio seminar, Pitt (March 6, 2014)
- Presented "Processes taking place on networks." Math Bio seminar, Pitt (Feb. 5, 2013)
- Presented an existence proof of travelling waves in a shape-space model of antigenic variation in Trypanosomes. Applied Math seminar, Pitt (April 5, 2013)
- Presented on modelling antigenic variation in Trypanosome infections. Math Bio seminar, Pitt (Dec. 9, 2011 & Oct. 29, 2012.)

TEACHING EXPERIENCE

2021 – Present **Teaching & Mentoring – GA Tech**

- Foundations in Quantitative Biology – This course is for first-year QBioS program PhD students; the small class sizes (11 students) allowed for close interactions that grew over the semester. The class is intense for both students and instructors with two lectures, a computational lab, and a homework assignment each week, culminating in a final project. I had the opportunity to lecture for four of the weeks on organismal behavior, excitability, and movement. I also helped several students who did final projects on topics related to these.
- Undergraduate Mentoring – During the fall semester 2021, I mentored a senior undergraduate student on a research project modeling variation in susceptibility and transmissibility in epidemic models. We found a few interesting results when considering potential correlations between susceptibility and transmissibility. For the spring semester 2022, we plan to write up these results along with further analysis (e.g., sensitivity). Contributed to a letter of support for graduate school applications.
- Graduate Mentoring – Giving support for applications (fellowship award, workshops), graduate work (proposal presentation during fall 2021), research project (developing model framework for latency of viral infections).
- Entering Mentoring training – Workshop offered by Offices of Undergraduate Education and Graduate Education & Faculty Development
- [KITP Quantitative biology summer research course](#) – Held hands-on labs (using Matlab, R, and Python) to go through the exercises on eco-evolutionary models of viral dynamics (August 9-13, 2021)
- [Quantitative Biosciences Workshop 2021: Epidemics](#) – Ran a hands-on breakout session using Matlab to go through the exercises; [see material](#) (May 17-18, 2021)
- Undergraduate Research Symposium – volunteered to serve as a judge of 5-minute talks (April 22, 2021)

2015 – 2017 **Teaching – Pitt**

- Graduate Linear Algebra – Teaching Assistant
- Intro to Finite and Discrete Mathematics – Instructor
- Intro to Real Analysis – Teaching Assistant
- Intro to College Algebra – Instructor
- Calculus I (2 sections) – Instructor
- Intro to College Algebra (2 sections) – Instructor
- Intro to College Algebra – Instructor
- Calculus III – Teaching Assistant

2015 – 2016 **Teaching Assistant Workshops – Pitt**

- Topics include: developing a teaching philosophy, syllabus construction, encouraging participation, teaching with Powerpoint, navigating difficult situations

SERVICE

2015 – present **Journal manuscript reviews**

- Kähne, M., Rüdiger, S., Kihara, A. H., and Lindner, B. (2019). Gap junctions set the speed and nucleation rate of stage I retinal waves. *PLoS computational biology*, 15(4), e1006355.
- Nielsen, B. F. (2017). “Regularization of ill-posed point neuron models.” *The Journal of Mathematical Neuroscience*, 7(1), 6.
- Ji, Y., Zhang, X., Liang, M., Hua, T., and Wang, Y. (2015). “Dynamical analysis of periodic bursting in piece-wise linear planar neuron model.” *Cognitive Neurodynamics*, 9(6), 573-579.

2018 – Spring 2020 **Emory**

- [Data Literacy Academic Learning Community](#) – six 1.5 hour discussions on data literacy, with a focus on interdisciplinary educational approaches, skill-building in data literacy; deliverables include a package on data literacy for lessons and curriculum to support undergraduate education
- [Data Science for Scientists ATL](#) – monthly meetings and special sessions on all things data (e.g. Jupyter notebook demos, version control with git, visualization with R)
- [Software carpentry workshop](#) – hosted by Data Science for Scientists ATL (Nov. 23-24, 2019) – to learn and help others learn basic shell commands, version control with git, and to use jupyter notebooks and some basic python code
- Datafest at Emory – undergraduates analyze a large dataset as part of the quantitative theory and methods initiative (April 2019)
- [Graduate Research Symposium](#) – helped with judging of research talks/posters (2018-2020)
- Volunteer for Atlanta Bike Emory: participating in Emory Cares International Service Day (Saturday Nov. 9, 2019)
- Committee on Environment – We discuss, review, and make recommendations on campus projects and initiatives that have an environmental impact on campus ([committee website](#)) (2019-2020)

2018 – Spring 2020 **Pitt**

- Representative from the math department in general body meetings; planned and organized graduate student events, including socials and the new student teaching orientation (2013 – 2017)
- Organized for graduate students as an opportunity to practice presenting their work (2014 – 2015)
- Volunteer at Pitt's Integration Bees – Helped with the undergraduate bee (2014 & 2015); high school bee (2015 & 2016)

April 2020 – present **Hearts to Nourish Hope Food Bank**

- Volunteer through Hands on Atlanta – monthly, from April-August 2020

2018 – 2019 **Human Rights Campaign (HRC)**

- Volunteer for HRC Atlanta Pride Brunch (Oct. 13, 2019)

2013 – 2014 **Volunteer for Neighborhood Learning Alliance (NLA)**

- Helped high school students complete online coursework to obtain equivalent credit for a failed or incomplete course-requirement, Pittsburgh, PA (July and August of 2013 & 2014).

GROUPS &
ORGANIZATIONS2019 – Fall 2020 **Emory, UGA, GA Tech**

- [Emory-UGA-GATech SARS-CoV-2 journal club](#) (co-organizer) – to collect, organize, and share information on high output of COVID-19 papers. We read papers anywhere from epidemiological data analysis to vaccine efficacy studies. We meet weekly, and the google doc is kept up-to-date – first meeting April 20; updated August 14.
- [Postdoctoral Science Magazine](#) (editor) – to highlight research being done at Emory University and other research institutions in Atlanta; develop skills in communicating science; [blog post \(Emory PDA\) on working remotely](#) – March 25, 2020; last updated December 2020

2017 – Spring 2020 **Emory University**

- Biology Postdoctoral Cohort – created to build social and professional connections amongst postdocs in biology and related areas
- [Theory and Modeling of Living Systems \(TMLS\) Initiative](#)
- [EmoRy R & coding club](#) – to learn R studio, R markdown, version control with git
- [Data Science for Scientists ATL](#) – to engage with the data science community at Emory, both learning and helping with events (meetings, workshops, etc.)
- [Data Literacy Academic Learning Community](#) – seeks to provide a space for discussion and exploration of data literacy, with a focus on interdisciplinary educational approaches, skill-building in data literacy (6 meetings during spring semester 2020); one of our main goals is to develop a data literacy package that includes lessons and curriculum to support undergraduate education

CURRENT PROFESSIONAL MEMBERSHIPS**National/international Organizations**

- Society for Industrial and Applied Mathematics ([SIAM](#))
- Society for Mathematical Biology ([SMB](#))
- American Mathematical Society ([AMS](#))
- Models of infectious disease agent study ([MIDAS](#))

AWARDS & FELLOWSHIPS2011 – 2013 **NSF-RTG, Complex Biological Systems Group**

- Complex biological systems across multiple space and time scales
Award number 0739261
- Funding for the first two years of graduate school

April 2011 **Culver Award for undergraduate research, Department of Mathematics**

- For work on modeling antigenic variation in Trypanosome infections

2010 – 2011 **NSF-RTG, Complex Biological Systems Group**

- Complex biological systems across multiple space and time scales
Award number 0739261
- Undergraduate research experience: summer (2010) & spring/summer (2011)

2007 – 2011 **University of Pittsburgh scholarships**

- University of Pittsburgh, 2007-2011
- Swanson School of Engineering, 2007-2009

**FUNDING
ACKNOWLEDGMENTS**August 2017 – present **DARPA INTERCEPT W911NF-17-2-0034**

Principal Investigator: Chris B. Brooke, PhD, Assistant Professor

- Funding source of my postdoctoral fellowship
- As part of the INTERCEPT program, our research team has aimed to investigate the potential for defective interfering particles to be used as a novel therapeutic against viral infections by understanding their basic evolutionary consequences within- and between-hosts.

2013 – 2014 NSF DMS 1219753

Principal Investigator: G. Bard Ermentrout, PhD, Distinguished University Professor

- Interactions between Stimuli and Spatiotemporal Activity
- Working with an undergraduate REU student (summer 2014), we published our results in PRE (2016). (see publications section)

REFERENCES

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