

## PERSONAL INFORMATION **Jeremy D Harris**

📍 1325 McLendon Ave NE APT 2, Atlanta, GA 30307

📞 (717) 329 - 7892

✉️ jharris387@gatech.edu

## WORK EXPERIENCE

June 2020 – present

### Postdoctoral Fellow Researcher

Department of Biological Sciences, Georgia Tech

- Advisor: Joshua Weitz, PhD, Associate Professor
- Aim: To develop mathematical models of eco-evolutionary dynamics of phage and bacteria systems. Particularly, we consider the virus-host ratio as an important variable of the interaction which may modify and be modified by the viral strategies take up – either the killing of hosts or persistence of viral genomes within hosts.

August 2017 – May 2020

### Postdoctoral Fellow Researcher

Department of Biology, Emory University

- Advisor: Katia Koelle, PhD, Associate Professor
- Developed mathematical models 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., Johnson, J.E., Koelle, K.V. (2020). "Estimation of transmission bottleneck sizes from de novo genetic variation in recipient hosts." (in preparation, anticipated date of submission: Sept. 2020)
- 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: Oct. 2020)

Submitted/  
In revision.

- Martin, B.E.\*, Harris, J.D.\*, Sun, J., Koelle, K.V., and Brooke, C.B. (2020). "Cellular co-infection increases the speed and efficiency of influenza A virus production and shapes the interferon response to infection." \*authors contributed equally. bioRxiv. doi: bioRxiv 752329. <https://doi.org/10.1101/752329> (after a second round of revisions, anticipated date of (re)resubmission to PLOS Path is Aug. 2020)

- Published.
- 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. <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

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### 2014 – present Talks & Posters (external)

- 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)
- 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, “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.)

**AWARDS & FELLOWSHIPS**2011 – 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

**TEACHING EXPERIENCE**

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**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**

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**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 Volunteering at Graduate and Undergraduate events – 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)

**2019 – present Committee on Environment – Emory**

- We discuss, review, and make recommendations on campus projects and initiatives that have an environmental impact on campus ([committee website](#))

- April 2020 – present **Volunteering – Hearts to Nourish Hope Food Bank**
- Volunteer through Hands on Atlanta – monthly, starting in April 2020
- 2018 – 2019 **Volunteering – Human Rights Campaign (HRC)**
- Volunteer for HRC Atlanta Pride Brunch (Oct. 13, 2019)
- 2013 – 2017 **Officer of the Graduate Student Organization – Pitt**
- Representative from the math department in general body meetings; planned and organized graduate student events, including socials and the new student teaching orientation
- 2014 – 2015 **Graduate Student Seminar Organizer – Pitt**
- Organized for graduate students as an opportunity to practice presenting their work
- 2014 – 2016 **Volunteer at Pitt's Integration Bees**
- Helped with the undergraduate bee (2014 & 2015); high school bee (2015 & 2016)
- 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 & ORGANIZATIONS

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- 2019 – present **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; updated April 2, 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

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**PROFESSIONAL  
MEMBERSHIPS &  
AFFILIATIONS****National/international Organizations**

- Society for Mathematical Biology (SMB)
- American Society of Virology (ASV)
- American Mathematical Society (AMS)
- Society for Industrial and Applied Mathematics (SIAM)
- National Society of Collegiate Scholars (NSCS)
- Golden Key International Honour Society

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**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)

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**REFERENCES****Katia Koelle**

Associate Professor  
Department of Biology  
Emory University  
1510 Clifton Road NE  
Atlanta, GA 30322  
(404) 727-6292  
katia.koelle@emory.edu

**Bard Ermentrout**

Distinguished University Professor  
Department of Mathematics  
University of Pittsburgh  
301 Thackeray Hall  
Pittsburgh, PA 15260  
(412) 624-8324  
bard@pitt.edu

**Brent Doiron**

Associate Professor  
Department of Mathematics  
University of Pittsburgh  
301 Thackeray Hall  
Pittsburgh, Pa 15260  
(412) 624-1759  
bdoiron@pitt.edu

**Chris B. Brooke**

Assistant Professor  
Department of Microbiology  
Carl R. Woese Institute for Genomic Biology  
University of Illinois at Urbana-Champaign  
601 S. Goodwin Ave  
Urbana, IL 61801  
(217) 265-0991  
cbrooke@illinois.edu