Ruby Kim

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Education

- **Duke University** — **Durham, NC**
  Ph.D. in Mathematics — *Aug 2017–May 2022*
  Thesis: Modeling the Interactions between the Circadian Clock, Dopamine, and Metabolism
  Advisor: Dr. Michael C. Reed
- **Pomona College** — **Claremont, CA**
  B.A. in Mathematics (Applied Track) — *Sep 2013–May 2017*
  Senior thesis: *Stability Analysis of a Tumor-Immune Model*
  Advisor: Dr. Ami E. Radunskaya

Employment

- **University of Michigan** — **Ann Arbor, MI**
  Postdoctoral Assistant Professor, Department of Mathematics — *Aug 2022–present*

Publications

1. **Kim R**, Woods T, Radunskaya A (2018). Mathematical Modeling of Tumor Immune Interactions: A Closer Look at the Role of a PD-L1 Inhibitor in Cancer Immunotherapy. Spora: A Journal of Biomathematics. 4:25–41. http://doi.org/10.30707/SPORA4.1Radunskaya
2. **Kim R**, Reed MC (2021). A mathematical model of circadian rhythms and dopamine. Theor Biol Med Model. 18(8). https://doi.org/10.1186/s12976-021-00139-w
3. **Kim R**, Nijhout HF, Reed MC (2021). One-carbon metabolism during the menstrual cycle and pregnancy. PLoS Computational Biology. 17(12): e1009708. https://doi.org/10.1371/journal.pcbi.1009708
4. **Kim R**, Witelski TP (2022). Uncovering the dynamics of a circadian-dopamine model influenced by the light-dark cycle. Mathematical Biosciences. 344: 108764. https://doi.org/10.1016/j.mbs.2021.108764
5. **Kim R**, Nijhout HF, Reed MC (2023). Mathematical insights into the role of dopamine signaling in circadian entrainment. Mathematical Biosciences. 356: 108956. https://doi.org/10.1016/j.mbs.2022.108956
6. Zhao L*, **Kim R***, Oremland LS, Chowkwale M, de Pillis LG, Brooks HZ (2024). A Survey of Mathematical Modeling of Hormonal Contraception and the Menstrual Cycle. In: Ford Versypt, A.N., Segal, R.A., Sindi, S.S. (eds) Mathematical Modeling for Women's Health. The IMA Volumes in Mathematics and its Applications, vol 166. Springer, Cham. https://doi.org/10.1007/978-3-031-58516-6_3

7. Best J, **Kim R**, Reed MC, Nijhout HF (2024). A mathematical model of melatonin synthesis and interactions with the circadian clock. Mathematical Biosciences. 109280.
8. Lee MP, Kim DW, Fang Y, **Kim R**, Bohnert ASB, Sen S, Forger DB (Under review). The association between real-world behavior-induced circadian disruption and depression risks: A large-scale cohort study of training physicians.
9. Sun G*, Hazelden J*, **Kim R**, Forger DB (Under review). Whole-cortex simulation reveals spatiotemporal patterns emerging from the interplay of network connectivity and intracellular dynamics.
10. **Kim R**, Fang Y, Lee M, Kim DW, Tang Z, Sen S, Forger DB (Under review). Day-to-day circadian misalignment is associated with disrupted seasonal encoding measured by wrist-wearable data.

Selected Presentations

- **Kim, R.** (2024, July). *Modeling inter-individual differences in circadian timekeeping based on wrist-wearable data.* Society for Mathematical Biology and Korean Society for Mathematical Biology Joint Annual Meeting, Seoul, South Korea.
- **Kim, R.** (2024, July). *Applications of circadian clock models to problems in physiology.* Society for Mathematical Biology and Korean Society for Mathematical Biology Joint Annual Meeting, Seoul, South Korea.
- **Kim, R.** (2023, June). *The orchestra of circadian timekeeping: a mathematical modeling perspective.* Mathematical and Computational Biology Workshop, Institute for Computational and Experimental Research in Mathematics, Providence, RI. Poster.
- **Kim, R.** (2023, May). *Mathematical modeling of the molecular clock and the dopaminergic system.* Mathematical Biology Seminar, New Jersey Institute of Technology, Newark, NJ. Virtual.
- **Kim, R.** (2022, December). *Large-scale Cortical Modeling.* Cognitive Fatigue MURI Research Forum, University of Michigan, Ann Arbor, MI.
- **Kim, R.** (2022, September). *Using large-scale cortical simulation to test theories of sleep.* Sleep Europe 2022, European Sleep Research Society, Athens, Greece.
- **Kim, R.** (2022, January). *A mathematical investigation of the circadian clock and dopaminergic system.* Mathematical Biology Seminar, University of Utah, Salt Lake City, UT. Virtual.
- **Kim, R.** (2022, January). *A mathematical investigation of the circadian clock and dopaminergic system.* Mathematical Biology Seminar, University of Pennsylvania, Philadelphia, PA. Virtual.
- **Kim, R.** (2021, April). *Mathematical modeling of circadian rhythms and dopamine.* Mathematical Biology Seminar, Duke University, Durham, NC. Virtual.
- **Kim, R.** (2020, May). *A mathematical model of circadian rhythms and dopamine.* Workshop on Mathematical and Computational Methods in Biology. Mathematical Biosciences Institute (MBI), Columbus, OH. Virtual.

Teaching

- **MATH 463: Mathematical Modeling in Biology** **Ann Arbor, MI**
  Instructor of Record, University of Michigan Department of Mathematics *Fall 2024*

- **MATH 462: Mathematical Modeling** — **Ann Arbor, MI**
  Instructor of Record, University of Michigan Department of Mathematics — *Winter 2023, 2024*
- **PHARMSCI 580: Mathematical Principles in Pharmaceutical Sciences** — **Ann Arbor, MI**
  Instructor of Record, University of Michigan College of Pharmacy — *Fall 2023*
- **MATH 156: Applied Honors Calculus II** — **Ann Arbor, MI**
  Instructor of Record, University of Michigan Department of Mathematics — *Fall 2022*
- **Introduction to Coding Theory** — **Durham, NC**
  Instructor, Duke Summer Workshop in Mathematics (SWiM) — *Summer 2022*
- **Certificate in College Teaching (CCT) Program** — **Durham, NC**
  Graduate Instructor, Duke Graduate School — *Mar 2018–May 2022*
- **Teaching Committee** — **Durham, NC**
  Graduate Representative, Duke Mathematics Department — *Aug 2021–May 2022*
- **MATH 106L: Laboratory Calculus and Functions II** — **Durham, NC**
  Instructor of Record, Duke Mathematics Department — *Spring 2020, Fall 2021*
- **MATH 106L: Laboratory Calculus and Functions II** — **Durham, NC**
  Lab Instructor, Duke Mathematics Department — *Spring 2021*
- **MATH 105L: Laboratory Calculus and Functions I** — **Durham, NC**
  Instructor of Record, Duke Mathematics Department — *Fall 2018, Fall 2019*
- **MATH 111L: Laboratory Calculus I** — **Durham, NC**
  Lab Teaching Assistant, Duke Mathematics Department — *Fall 2017*

Service

- **Association for Women in Mathematics (AWM)** — **Ann Arbor, MI**
  U-M Chapter Executive Board Member, U-M Department of Mathematics — *Jan 2023–present*
- **Lab of Geometry at Michigan (LoG(M))** — **Ann Arbor, MI**
  Undergraduate Research Mentor, U-M Department of Mathematics — *Jan–May 2023*
- **Association for Women in Mathematics (AWM)** — **Durham, NC**
  Student chapter founder and co-president, Duke Mathematics Department — *Jan 2019–May 2022*
- **Society for Industrial and Applied Mathematics (SIAM)** — **Durham, NC**
  Student chapter president, Duke Mathematics Department — *Aug 2019–May 2022*
- **Triangle Area Graduate Mathematics Conference (TAGMaC)** — **Durham, NC**
  Lead organizer, Duke-UNC-NCSU Mathematics Departments — *Fall 2018, Fall 2021*

- **Triangle Contest in Mathematical Modeling (TriCoMM)** — **Durham, NC**
  Co-organizer, Duke Mathematics Department — *Fall 2021*
- **Graduates Achieving Inclusion Now (GAIN)** — **Virtual**
  Moderator, Duke and Purdue Mathematics Departments — *Fall 2021*
- **Launch Point Conference** — **Virtual**
  Co-organizer, Duke-UNC-WFU Mathematics Departments — *Spring 2020*

Awards

- **Allen Shields Outstanding Postdoctoral Assistant Professor Teaching Award**
  University of Michigan Mathematics Department — *2024*
- **Nomination for Dean's Award for Excellence in Teaching**
  Duke Graduate School — *2021*
- **L.P. Smith Award for Excellence in Teaching**
  Duke Mathematics Department — *2020*
- **SIAM Student Chapter Certificate of Recognition**
  Society for Industrial and Applied Mathematics (SIAM) — *2020*

Workshops

- **Computational Genomics Summer Institute (CGSI)** — **Los Angeles, CA**
  University of California, Los Angeles — *Jul 12-Aug 4, 2023*
- **Mathematical and Computational Biology Workshop** — **Providence, RI**
  Institute for Computational and Experimental Research in Mathematics (ICERM) — *Jun 12-16, 2023*
  Poster titled "The orchestra of circadian timekeeping: a mathematical modeling perspective."
- **Collaborative Workshop for Women in Mathematical Biology** — **Minnetonka, MN**
  Institute for Mathematics and its Applications (IMA) and Optum — *Jun 20-24, 2022*
  Project titled "Modeling the Stability and Effectiveness of Dosing Regimens of Oral Hormonal Contraceptives" mentored by Lisette de Pillis and Heather Zinn Brooks.
- **Data-Driven Mathematical & Statistical Modeling** — **Virtual**
  Statistical and Applied Mathematical Sciences Institute (SAMSI) — *Jul 12-16, 2021*
  Parameter estimation, sensitivity analysis, and uncertainty quantification. Project mentored by John Nardini on Sparse Identification of Nonlinear Dynamics (SINDy).
- **Workshop on Mathematical and Computational Methods in Biology** — **Virtual**
  Mathematical Biosciences Institute (MBI) — *May 5-8, 2020*
  Gave a parallel talk on mathematical modeling of circadian rhythms and dopamine.
- **Tutorial Workshop on Parameter Estimation for Biological Models** — **Raleigh, NC**
  NC State Research Training Group in Mathematical Biology — *Jul 29-Aug 1, 2019*
  Basic techniques associated with identifiability theory, parameter estimation, and uncertainty

quantification in biological models.