

## CURRICULUM VITA

**Daniel B. Forger III, Ph.D.**

Department of Mathematics

University of Michigan

2074 East Hall

525 East University

Ann Arbor, MI 48109

Telephone: (734) 763-4544

Email: forger@umich.edu

3/15/2024

### EDUCATION

- 1999 B.A., Harvard College  
Cambridge, MA 02138  
Applied Mathematics (Medical Sciences)  
Undergraduate Thesis Title: “The Modeling of Circadian Oscillators”
- 1999 M.S. Harvard Graduate School of Arts and Sciences (GSAS)  
Cambridge, MA 02138-3654  
Applied Mathematics (Medical Sciences)
- 2003 Ph.D., New York University  
New York, NY 10012  
Mathematics  
Dissertation Title: “Deterministic and Stochastic Mathematical Modeling and Computer Simulation of the Mammalian Intracellular Circadian Clock”

### TRAINING

#### *Postdoctoral*

- 2003-2005 Sloan Post-Doctoral Fellow, Blau Lab, Biology Department  
New York University, New York, NY

#### *Pre-doctoral*

- 1999-2000 Pre-doctoral Trainee in Sleep, Circadian and Respiratory Neurobiology,  
Brigham and Women’s Hospital, Harvard Medical School (NRSA T32)

#### *Fellowships*

- 2000-2003 National Science Foundation Graduate Research Fellowship
- 2003-2005 Sloan Foundation Fellowship in Computational Molecular Biology

### ACADEMIC APPOINTMENTS

- 1997-1999(summers) Research Assistant, Division of Engineering and Applied Sciences,  
Harvard University

2000-2001(summers) Research Associate, Paydarfar and Clay Labs,  
Marine Biological Laboratories, Woods Hole, MA

2003 (fall) Research Consultant, Paydarfar Lab,  
Department of Neurology, University of Massachusetts Medical School

2005-2009 Assistant Professor of Mathematics, University of Michigan

2009-2013 Associate Professor of Mathematics and Assistant Research  
Professor of Computational Medicine and Bioinformatics,  
University of Michigan

2013-current Professor of Mathematics and Research  
Professor of Computational Medicine and Bioinformatics,  
University of Michigan

2017-2019 Michigan Institute for Data Science core faculty member  
University of Michigan

2019 (fall) – Current Robert W. and Lynn H. Browne Professor in Science  
University of Michigan

2019 – Current Consultant/CSO Arcascope

2019 – 2020 Visiting Scholar, NSF-Simons Center for Mathematical &  
Statistical Analysis of Biology  
Harvard University

2023 – Current Director Michigan Center for Applied and Interdisciplinary Mathematics

## **GRANT SUPPORT**

9/1/2022 – 8/31/2027 ARO MURI  
“Understanding and Predicting Cognitive Fatigue across Multiple  
Timescales, Distinct Aspects of Cognition, and Different  
Individuals with Multiscale Whole Cortex Models”  
\$6,250,000 Forger (PI)

8/1/2021 – 7/31/2024 NSF DMS Mathematical Biology  
“Improving Physiological Modeling with Machine Learning”  
\$359,999 Forger (PI)

### *Previous*

9/1/2020– 8/31/2022 NIH SBIR

“Assessing the impact of app-delivered lighting interventions on fatigue in three populations of cancer patients”  
 (Walch and Tewari PIs) \$1,603,417

12/1/2018 – 5/31/2023 Human Frontier Science Program  
 “Sleep, the clock, and the brain: a neuromathematical approach”  
 \$1,050,000 (\$945,000 direct costs)  
 (Forger PI, Brown and Ueda, co-PI)

4/1/2018 – 3/31/2023 NIMH R01  
 “Mobile technology to identify behavioral mechanisms linking genetic variation and depression”  
 \$3,801,721 Sen (PI)

7/1/2018– 6/1/2020 “Understanding how the brain processes music through the Bach Trio Sonatas” (Forger and Kibbie PIs) \$75,000

8/1/2017 – 7/31/2021 NSF DMS Mathematical Biology  
 “Determining the Mathematics Principles of Daily Timekeeping”  
 \$300,000 Forger (PI)

1/1/2017 – 12/31/2019 Michigan Institute for Data Science  
 “Identifying Real-time Data Predictors of Stress and Depression Using Mobile Technology “ (Sen PI, Forger and others co-PI)

4/12/2017 – 8/11/2019 Michigan Exercise Sports Science Initiative, “Mobile sleep and circadian rhythm assessment for enhanced athletic performance”  
 Goldstein (PI) Forger co-PI \$197,537 direct costs

9/1/2018 – 6/28/2019 NIH SBIR  
 “Developing a circadian wellness tool for cancer patients”  
 (Walch and Forger PIs) \$221,237

1/1/2016 – 9/1/2018 Gilmore Fund for Sleep Research \$14983 direct costs (Forger PI)

10/1/2015 – 12/31/2017 MCubed “Analyzing light, human sleep and circadian rhythms  
 60K direct costs (Forger PI, Goldstein and Wong, co-PI)

9/1/2015-8/31/2017 Collaboration between University of Michigan and Shanghai JiaoTong University (Forger and Cai PIs) \$200K direct costs

12/1/2013-11/30/2016 Army Research Office  
 W911NF-13-1-0449 \$360,000  
 Modeling Subconscious Vision

	Forger (PI)
9/1/2012-8/31/2016	Human Frontiers of Science Project Grant RPG0024/2012 \$1,050,000 (\$945,000 direct costs) Networks, Genetics, Clocks and Psychosis, A Multi- Disciplinary and Multi-scale Approach Forger (PI), Piggins (Co-PI), Takumi (Co-PI)
6/01/2014-5/31/2015	Air Force Office of Scientific Research (AFOSR) FA9550-11-1-0165 \$196,530 Understanding Synchrony and Stochasticity in Coupled Neuronal and Genetic Oscillators Forger (PI)
7/15/2011-12/31/2013	Air Force Office of Scientific Research (AFOSR) FA9550-11-1-0165 \$395,586 Information Processing and Collective Behavior in a Neuronal Model System Forger (PI)
2010-2013	U Michigan Cardiac Center \$50,000 Forger (Co-PI)
2010- 2013	National Science Foundation (NSF) SCREMS: Scientific Computing and Mathematics at the University of Michigan \$175,000.00 Forger (Co-PI)
2009-2011	Pfizer Modeling CKI Inhibition \$120,000
2008-2011	Air Force Young Investigator \$357,389 Modeling the Physiology of Circadian Timekeeping
2006-2011	NIH R01 GM063642, \$1,343,964 (total) Forger (Co-PI) Genetic Systems Bioengineering for Escherichia coli
2007-2011	NIH R01 GM060387, \$1,231,055, (total) Forger (Co-PI) Casein Kinase I and the Regulation of Circadian Rhythm
2008-2011	Air Force Office of Scientific Research (AFOSR) FA9550-08-1- 0111, \$408,253

Forger (Co-PI)  
Mathematical Modeling of Circadian and Homeostatic Interaction

2006 Air Force Office of Scientific Research (AFOSR)  
\$22,000  
Forger (PI, through SIAM)  
Workshop on Modeling Circadian Rhythmicity, Sleep Regulation  
and Neurobehavioral Function

### **COMMITTEES AND MEMBERSHIPS**

Society for Research on Biological Rhythms

Society for Industrial and Applied Mathematics

American Guild of Organists

*Previous*

External Advisory Board for the Center for Research on Biological Clocks

Air Force PRET External Review (2004)

Advisory Board for 2010-2011 Theme Year Mathematical Biosciences Institute

### **AWARDS AND HONORS**

1999 Richard Kronauer Travel Award for Excellence in Biological Modeling

1999 David McCord Prize, Harvard College

2000, 2002 Travel Award, Society for Research on Biological Rhythms

2003 Stuyvesant High School Mentor Award

2004 Wilhelm Magnus Memorial Prize for Significant Contributions to the  
Mathematical Sciences

2004 Dean's Outstanding Dissertation Award in the Natural Sciences

2004 Burroughs Wellcome Fund Career Award at the Scientific Interface (Finalist)

2007 Air Force Office of Scientific Research Young Investigator

2012, 2018 PI Human Frontiers of Science Program Grant (< 5% of proposals are funded)

2018 Provost's Teaching Innovation Prize (Nominated and Finalist)

2019 Robert W. and Lynn H. Browne Professor  
2022 Keynote European Society for Theoretical and Mathematical Biology/Society for  
Mathematical Biology

### **EDITORIAL POSITIONS**

June 2007 issue Guest Editor for the Journal of Biological Rhythms  
Editorial Board Journal of Biological Rhythms 2010-2022  
Editorial Board Journal of Theoretical Biology 2014-2022  
Editorial Board Current Opinion in Systems Biology  
Editorial Board Mathematical Biosciences and Engineering  
June 2020 issue Guest Editor for Current Opinion in Systems Biology  
Section Editor PLoS Digital Health

#### *Ad Hoc Reviewer*

National Science Foundation, Science, Cell, Proceedings of the National Academy of Sciences,  
CNS Journal, PLOS Computational Biology, Biophysical Journal, The Journal of Biological  
Rhythms, The Journal of Theoretical Biology, Physics Letters A, Journal of Neuroscience,  
ComPlexUs, Molecular Systems Biology, Cell, Cell Reports, Molecular Cell, Current Biology,  
PLoS One, Journal of the Royal Society Interface ...

### **TEACHING ACTIVITIES**

Course Assistant, Harvard University  
1998(fall) Nonlinear Dynamics and Chaos  
  
Course Instructor, University of Michigan  
2006(winter) Math 563 Advanced Mathematical Biology: Analyzing Biological Rhythms  
  
2006(fall) Math 463 Mathematical Modeling in Biology  
  
2007(winter) Math 563 Advanced Mathematical Biology: PDE modeling in Biology  
  
2007(fall) Math 571 Numerical Scientific Computing  
  
2008(winter) Math 564 Topics in Mathematical Biology: Analyzing Biological Rhythms  
  
2009(winter) Math 471 Introduction to Numerical Methods  
  
2010(winter) Math 564 Topics in Mathematical Biology: Scientific Computing in Medicine  
  
2011(winter) Math 571 Numerical Scientific Computing  
  
2012(winter) Math 564 Topics in Mathematical Biology: Analyzing Biological Rhythms

- 2012(fall) Math 463 Mathematical Modeling in Biology
- 2013(winter) Math 563 Advanced Mathematical Biology: Modeling Vision
- 2013(fall) Math 463 Mathematical Modeling in Biology
- 2014(fall) Math 463 Mathematical Modeling in Biology
- 2015(winter) Math 564 Topics in Mathematical Biology: Analyzing Biological Rhythms
- 2015(fall) Math 463 Mathematical Modeling in Biology
- 2016(winter) Math 563 Math, Music and the Brain
- 2016(fall) Math 463 Mathematical Modeling in Biology
- 2017(fall) Math 463 Mathematical Modeling in Biology
- 2018(winter) Math 498: Math, Music and the Brain
- 2018(fall) Math 463: Mathematical Modeling in Biology
- 2020(fall) Math 463: Mathematical Modeling in Biology (2 sections)
- 2021(winter) Math 564: The Mathematics of Wearables
- 2022 (fall) Math 463: Mathematical Modeling in Biology
- 2023(Winter) Math 564: Physiological Modeling and Prediction with Differential Equations and Machine Learning
- 2023 (fall) Math 463: Mathematical Modeling in Biology
- 2024(Winter) Math 564: Physiological Modeling and Prediction with Differential Equations and Machine Learning

Teaching of Modules in University of Michigan Courses:

Bioinformatics 525 (Winter 2007), Neuroscience 616 (Winter 2008, Winter 2010, Winter 2012, Winter 2015), UC 415 (Fall 2011, Winter 2012, Fall 2012, Fall 2017, Fall 2018, Fall 2020, Fall 2021, Fall 2022, Fall 2023).

Teaching Independent Study Courses, Research Experiences for Undergraduates and Formal Research Mentoring:

REU: Melinda Kleczynski (2006), Hasan Cheema (2008), Michelle Fleschner (2009, with

Cecilia Diniz-Behn), Andre Schultz (2010), Samuel Faught (2010, 2011), Panigiotis Fotiadis (2011), Kirill Serkh (2011), Alexander Verros (2012, 2013) Christopher Bate (2013), Marc Nemeth (2013), Jonathan Timkovich (2013), Sam Christensen (2015, 2017), James Hazelden (2019, 2020), Andy Chen (2023)

Math 499: Andre Schultz (Winter 2010), Samuel Faught (Winter 2011), Panagiotis Fotiadis (Fall 2011), Christopher Bate (Winter 2013), Marc Nemeth (Winter 2013), Sam Christensen (2015), Abdullah Dilawar (Fall 2018), Hee Jeon (Fall 2018), Artharva Talpade (Fall 2018)

Biophysics 399: Samuel Christensen (Winter 2016)

Physics 498: Choon Kiat Sim (Winter 2007)

Bioinformatics 599: Xinhang Li

Math 700: Kirill Serkh (Fall 2011), Daniel DeWoskin (Winter 2012), Olivia Walsh (Fall 2012), Kevin Hannay (Fall 2014), Yining Lu (Fall 2015, Winter 2016), Ningyuan Wang (Fall 2017), Caleb Mayer (Fall 2019, Winter 2020), Carson Dudley (Fall 2023)

Summer Biomedical Research Proposal: Amrit Misra (Summer 2010)

University Research Opportunity Program: Alexander Verros (2012-2013)

### **COMMITTEE AND ORGANIZATIONAL SERVICE**

President's Biosciences Initiative Co-ordinating Committee (2018-current)

Eisenberg Depression Center Hiring Committee (2022-current)

Schmidt AI in Science Advisory Committee (2023-current)

MCAIM Steering Committee (2018-current)

Chair of organizing committee: Workshop on Modeling Circadian Rhythmicity, Sleep Regulation and Neurobehavioral Function, held concurrently with the annual meetings of the Society for Mathematical Biology and the SIAM Life Sciences Meeting funded by AFOSR (2006)

Organizer, Workshop on Circadian Rhythms in Plants and Fungi at the Mathematical Biosciences Institute (2010)

Program Committee, Biannual Meeting of the Society for Research on Biological Rhythms (2012)

Organizer MBI/NIMBIOS/CAMBAM Summer Graduate Program 2014

Organizer, Lorentz Center Workshop on Human Circadian Rhythms 2015



University of Michigan Committee Service:

Director 2019 University of Michigan Ideas Lab

Organizer, University of Michigan Wearables Summit 2021

Mathematics Department Committees and Service

Personnel (2012), Executive (2007-2008), Undergraduate Advising (2008-2012), Research Experiences for Undergraduates (2009-2010, 2010-2011, 2015-2016, member 2012-2013 chair), Computer (2007-2011, 2013, 2015-2016, 2020-2022), Applied Analysis Exam (2009-2011), Teaching in Department Ethics Course (Fall 2011, Winter 2012, Fall 2012, Fall 2013, Fall 2014, Fall 2015, FALL 2017, Fall 2020), Undergraduate Mathematical Modeling (2015, 2016, 2017), Department Liaison (2015, 2016, 2017, 2020, 2021, 2022)

Department of Computational Medicine and Bioinformatics Committees and Service:

Bioinformatics/CCMB seminar committee, (2010-2012, chair 2010-2011) CCMB Pilot grant review panel (2012).

MIDAS: Annual Symposium program committee (2018)

Graduate Student PhD Thesis Committees (at the University of Michigan, unless otherwise stated): Harsh Jain (2008), Katarina Bodova (2009), Megan Hagenauer (2010), Samantha Zhang (2011), Erin Shellman (2012), Zepeng Yao (2016). Andre Souza (2016), Caroline Adams (2018), Scott Rich (2018), Alex Golden (2018), Zhendga Li (2019), Amiya Patanaik (external reviewer, Nanyang Technological University, Singapore, 2014), Julia Stone (external reviewer, Monash University)

### **Selected Talks**

2024 Conference on “Biomarkers of the Molecular Circadian Clock” University of Warwick in Venice

2024 National Institute for Theory and Mathematics in Biology (Northwestern/University of Chicago)

2024 Aga Khan University Nairobi Faculty Activity Roundtable

2024 Notre Dame Applied and Computational Mathematics and Statistics Colloquium

2023 Human Frontier Science Annual Meeting CapeTown South Africa

2023 METRIC Symposium

2023 Michigan Conference on AI in Science

2023 Annual Sleep Meeting Indianapolis IN

2023 UT Austin Biomedical Engineering Colloquium

2023 Walter Reed Army Institute of Research

2022 Keynote European Society for Theoretical and Mathematical Biology/Society for Mathematical Biology

2022 European Biological Rhythms Society

2022 Society for Research on Biological Rhythms

2022 Oden Institute Seminar

2022 Center for Technology in Behavioral Health Seminar Dartmouth

2021 University of Arizona Applied Mathematics Seminar  
2021 NIH Conference on “Novel Approaches to Understand Sleep and Circadian Effects of COVID19”  
2021 Colorado Sleep and Circadian Summer School  
2021 EBRIS Trainee Day  
2021 Northwestern Applied Math Colloquium  
2020 Courant Institute Biomathematics/Computational Biology Colloquium  
2020 Simons Center for Computational Biology  
2020 Harvard Center for Mathematics Sciences and Applications  
2020 Mathematical Bioscience Institute “Mathematical and Computational Methods in Biology”  
2020 Sleep 2020  
2020 MIDAS COVID Seminar  
2020 Dartmouth Mathematics Colloquium  
2020 Harvard Quantative Biology Group Meeting  
2020 Harvard Center for Brain Sciences Neurolunch  
2020 UCLA IPAM seminar on Computational Psychiatry  
2020 Harvard Systems Biology Theory Lunch  
2019 KAIST Mathematics Department  
2019 University of Tokyo  
2019 Harvard Sleep Grand Rounds  
2019 Harvard QBio Group Meeting  
2019 Colorado School of Mines AMS Distinguished Lecture  
2019 Masterclass, Rocky Mountain Chapter of the American Guild of Organists  
2019 University of Michigan Conference on the Organ  
2019 European Biological Rhythms Society Annual Meeting Invited Lecture  
2019 Society for Mathematical Biology  
2019 Invited Speaker Biological Distributed Algorithms PODC  
2018 Northwestern Bioinformatics Seminar  
2018 Warwick Mathematics Centre  
2018 Society for Research on Biological Rhythms Trainee Day  
2018 SIAM Conference on the Life Sciences Minitutorial (4 talks)  
2018 Sleep Research Society Workshop on Biomarkers  
2017 Michigan Nobel Symposium “2017 Nobel Prize in Physiology or Medicine”  
2017 National Cancer Institute Conference on Circadian Rhythms.  
2017 SLEEP 2017 talk in Session “Human Circadian Rhythms: Big Data Methods”  
2017 Rensselaer Distinguished Mercer Lecture “Biological Rhythms, Physiology of Human Behavior and Computational Neuroscience”  
2017 UT Austin Mathematical Colloquium  
2016 Boeing Distinguished Lecture, University of Washington  
2016 Duke University “From a network of 10,000 neurons to a smartphone app with 125,000 users: linking scales in biological rhythms”  
2016 Summer School of Mathematical Modeling in Biological Systems (Institute of Natural Sciences, Shanghai Jiao Tong University) 10 hours of lectures

2016 Society for Research on Biological Rhythms Biannual Meeting, talk in neuronal networks symposium, talk at Trainee day and participation in Meet the Professor event

2016 SIAM Life Sciences/Annual Meeting talk in Minisymposium in honor of Charles Peskin

2016 SLEEP 2016 talk in Session “Novel approaches for Circadian Entrainment”

2016 Texas A&M conference on “Contemporary Mathematical Challenges in the Life Sciences”

2016 Georgia State University “From a network of 10,000 neurons to a smartphone app with 125,000 users: linking scales in biological rhythms”

2016 ARO “Mathematical approaches to study circadian rhythms”

2016 Virginia Commonwealth University Mathematics Colloquium “From a network of 10,000 neurons to a smartphone app with 125,000 users: linking scales in biological rhythms”

2015 Walter Reed “From a network of 10,000 neurons to a smartphone app with 125,000 users: linking scales in biological rhythms”

2015 University of Michigan Conference on Computational Discovery in Complex Systems Biology “From a network of 10,000 neurons to a smartphone app with 125,000 users: linking scales in biological rhythms”

2015 World Congress of Chronobiology “Multiple Roles of GABA in Circadian Timekeeping”

2015 MPIPKS “Principles from Circadian Timekeeping”

2015 SJTU Institute for Natural Sciences “Networks of Clocks”

2015 HFSP PI meeting “Clocks and Mood”

2015 Lorentz Center “A Global Assessment of Sleep Schedules using Smartphone Data”

2015 University of Chicago “From the nonstandard kinetics of a single PER2 molecule to iPhone app with 100,000 users: linking scales in biological rhythms”

2015 University of Alabama Medical School “From a network of 10,000 neurons to an iPhone app with 100,000 users: linking scales in biological rhythms”

2015 University of Michigan Computational Medicine and Bioinformatics Seminar “A global assessment of sleep schedules using smartphone data”

2014 University of Surrey “From a Single Molecule to an iPhone app with > 100,000 users: Linking scales in Biological Rhythms”

2014 UCSD “From a Single PER2 Molecule to an iPhone app with 100,000 users: Linking scales in Biological Rhythms”

2014 McGill University “Using Mathematical Modeling to Understand Daily Timekeeping”

2014 Mathematical Biosciences Institute: Series of 10 Lectures on Biological Clocks

2014 Virginia Tech Seminar Series (Blacksburg VA) “Using Mathematical Modeling to Understand Daily Timekeeping”

2013 University of Michigan Depression Center Colloquium “Circadian Regulation and Mood Disorders”

2013 Distinguished Interdisciplinary Speaker, Howard Hughes Medical Institute Seminar Series. Gettysburg College, Gettysburg, PA 3 Talks: “A Mechanism for Robust Daily Timekeeping,” “How to Avoid Jetlag,” and “The Mathematics of Biological Clocks”

2013 Gordon Chronobiology Conference (Newport RI) "Supermodels see the light of day: How high performance computing can help the next generation of circadian research."

2013 NCTS Conference on Mathematical Physiology (Taiwan) "Using Mathematical Modeling to Understand Biological Timekeeping"

2013 RIKEN Brain Sciences Institute (Japan) "Using Mathematical Modeling to Understand Biological Timekeeping"

2012 International Conference on Applied Mathematics, City University of Hong Kong, "A Mechanism for Robust Daily Timekeeping"

2012 Institute for Natural Sciences, Shanghai Jiao Tong University "Using Mathematics to Understand Biological Timekeeping"

2012 711th Human Performance Wing, Wright-Patterson Air Force Base "Jetlag: Optimal Light Treatments for Reentrainment in Minimal Time"

2012 Northwestern University "Jetlag: Optimal Light Treatments for Reentrainment in Minimal Time"

2012 Duke University "A Mechanism for Robust Circadian Timekeeping"

2012 University of Cincinnati "Jetlag: Optimal Light Treatments for Reentrainment in Minimal Time"

2011 Radcliffe Institute "Multiscale Modeling"

2011 University of Pennsylvania "The Surprising Complexity of Daily Timekeeping"

2011 Gordon Chronobiology Conference (Italy), "Multiscale Predictions within the SCN"

2011 Society for Mathematical Biology/European Society for Mathematical and Theoretical Biology "The Surprising Complexity of Signal Processing in Clock Neurons"

2011 University of Massachusetts (Amherst) "Multiscale Predictions within the SCN"

2010 Mathematical Biosciences Institute, Ohio State University "Timekeeping in Cells vs. Timekeeping in Networks"

2010 RIKEN conference on Mathematical Sciences and their Application (Kamisuwa) "The Mathematics of Biological Time"

2010 Hiroshima University Medical School "Using Mathematical Modeling to Understand Mammalian Timekeeping"

2010 Lorenz Center, University of Leiden (Holland) "Computational Neuroscience of Circadian Rhythms"

2010 University of Warwick (England), "Understanding Mammalian Circadian Timekeeping Through Mathematical Modeling"

2010 Math Department Colloquium (Michigan), "The Mathematics of Biological Time"

2010 Society for Industrial and Applied Mathematics Conference on the Life Sciences, "The Geometry of BioChemical Time"

2009 South Eastern and Central Texas Center for Clocks annual meeting, Keynote address, "Using Models to Make Unexpected Predictions about Biological Rhythms"

2009 Ohio American Physical Society Keynote Address "Coordinating Biological Timekeeping in Mammals: Noise and Silence Prevail"

- 2009 Michigan Systems Biology Symposium "Coordinating Mammalian Timekeeping"
- 2009 Max Planck Institute for the Physics of Complex Systems (Dresden), "Coordinating Biological Timekeeping in mammals: Noise and Silence Prevail"
- 2009 University Manchester, "Modeling Circadian Rhythms"
- 2009 University of Texas Southwestern, "Using Models to Make Unexpected Predictions about Biological Rhythms"
- 2008 University of North Carolina, "Voter Fraud in the SCN: Detecting the Crimes of Biological Timekeeping"
- 2008 University of Wisconsin, "Voter Fraud in the SCN: Detecting the Crimes of Biological Timekeeping"
- 2008 Pfizer, "Modeling Mammalian Timekeeping"
- 2008 Rensselaer Polytechnic Institute "Coordinating Biological Timekeeping in mammals: Noise and Silence Prevail"
- 2008 Cold Spring Harbor Meeting (Hinxton, England), "Modeling Mammalian Circadian Timekeeping"
- 2008 Institute for Mathematics, University of Minnesota (3 talks), "Stochastic Modeling of Molecular Reaction Networks" "Type I Type II PERCs and Coupling" "Applications to Circadian Rhythms"
- 2008 Society for Industrial and Applied Mathematics Conference on the Life Sciences "Clustering, Multistability and the Complex Neuronal Coding of Daily Timekeeping"
- 2008 Harvard Conference to award the Farrell Prize, "BMAL1 and Noise-Induced Rhythms"
- 2008 Society for Mathematical Biology "BMAL1 and Noise-Induced Rhythms"
- 2007 National University of Singapore, "Modeling Mammalian Circadian Rhythms"
- 2007 RIKEN Center for Developmental Biology (Kobe) "Modeling Mammalian Circadian Timekeeping"
- 2007 Harvard Systems Biology Theory Lunch, "What makes a Genetic Network a Clock?"
- 2007 Indiana University/Purdue University Indianapolis, "What makes a Genetic Network a Clock?"
- 2007 Kavli Institute for Theoretical Physics, UC Santa Barbara "Discovering the Molecular basis of biological oscillations"
- 2007 Duke Conference in Honor of Michael Reed, "What makes a genetic network a clock?"
- 2007 Midwest Conference on Systems Biology, "Discovering the Molecular Basis of Biological Oscillations"
- 2007 Mathematical Association of America Indiana Section, "What makes a genetic network a clock?"

## **PUBLICATIONS**

*Patent Application*

**Forger D**, Tyler J, Mayer C, Sen S, Fang Y, Flora C, Choi SW, Tewari M Systems and methods for enhancing infection detection and monitoring through decomposed physiological data US Patent App. 17/859,647

*Book*

Biological Clocks, Rhythms and Oscillations: The Theory of Biological Timekeeping,  
*MIT Press* (2017)

*Articles*

Shapiro B, Fang Y, Sen S and **Forger DB** Unraveling the interplay of circadian rhythm and sleep deprivation on mood: A Real-World Study on first-year physicians *PLOS Digital Health* 3 (2024) e0000439

Kim DW, Lee MP and **Forger DB** Wearable Data Assimilation to Estimate the Circadian Phase *SIAM Journal on Applied Mathematics* (2023) S452-S475

Kim DW, Mayer C, Lee MP, Choi SW, Tewari M and **Forger DB** Efficient assessment of real-world dynamics of circadian rhythms in heart rate and body temperature from wearable data *Journal of the Royal Society Interface* 20 (2023) 20230030

Mayer C, Walch, O, **Forger DB**, and Hannay K Impact of light schedules and model parameters on the circadian outcomes of individuals *Journal of Biological Rhythms* 38 (2023) 379-391

Wang, N and **Forger DB**, The asymmetric particle population density method for simulation of coupled noisy oscillators *Journal of Computational Physics* (2023), 112157

Shapiro B, **Forger DB** Reducing chronic disease may just be a walk in the park *Cell Reports Medicine* 3 (2022), 100874

KN Gilley, ... **Forger DB**, ... Choi, SW Risk factors for covid-19 in college students identified by physical, mental, and social health reported during the fall 2020 semester: observational study using the Roadmap ... *JMIR mental health* 9 (2), e34645

Mayer C, Tyler J, Fang Y, Flora C, Frank E, Tewari M, Choi SW, Sen S and **Forger DB** Consumer-grade wearables identify physiological changes of disease in COVID-19 symptomatic individuals *Cell Reports Medicine* 3 (2022) 100601

Tyler J, **Forger DB** and Kim JK Inferring causality in biological oscillators *Bioinformatics* 38 (2022) 196-203.

Tyler J, Lu Y, Dunlap J and **Forger DB** Evolution of the transcriptional mechanisms in circadian clocks *Genome Biology* 23 (2022) 1-18.

Wang N and **Forger DB** The Level Set Kalman Filter for State Estimation of Continuous-Discrete Systems *IEEE Transactions on Signal Processing* 70 (2021) 631-642.

Tyler J, Fang Y, Goldstein C, **Forger DB**, Sen S and Burmeister M Genomic heterogeneity affects the response to Daylight Saving Time *Scientific Reports* 11 (2021) 14792.

Stinchcombe A, Hu C, Walch OJ, Faught S, Wong KY and **Forger DB** M1-type, but not M4-type, melanopsin ganglion cells are physiologically tuned to the central circadian clock *Frontiers in Neuroscience* 15 (2021) 652996.

Huang Y, Mayer C, Cheng P, Siddula A, Burgess HJ, Drake C, Goldstein C, Walch OJ and **Forger DB** Predicting circadian phase across populations: a comparison of mathematical models *Sleep* 44 (2021) zsab126.

Gilley KN, Baroudi L, Yu M, Gainsburg I, Reddy N, Bradley C, Cislo C, Rozwadowski ML, Clingan CA, DeMoss MS, Churay T, Birditt K, Colabianchi N, Chowdhury M, **Forger D**, Gagnier J, Zernicke RF, Cunningham JL, Cain SM, Tewari M, Choi SW Risk Factors for COVID-19 in College Students Identified by Physical, Mental, and Social Health Reported During the Fall 2020 Semester: Observational Study Using the Roadmap App and Fitbit Wearable Sensors *JMIR Mental Health* 9 (2021) e34645.

Cislo C, Clingan C, Gilley K, Rozwadowski M, Gainsburg I, Bradley C, Barabas J, Sandford E, Olesnavich M, Tyler J, Mayer C, DeMoss M, Flora C, **Forger DB**, Cunningham JL, Tewari M, Choi SW Monitoring Beliefs and Physiological Measures Using Wearable Sensors and Smartphone Technology Among Students at Risk of COVID-19: Protocol for a mHealth Study *JMIR Research Protocols* 10 (2021) e29561.

Bowman C, Huang Y, Walch OJ, Fang Y, Frank E, Goldstein C, Sen S, **Forger DB** A Method for Characterizing Daily Physiology from Widely Used Wearable Devices *Cell Reports Methods* 1 (2021) 100058.

Flora C, Tyler J, Mayer C, Warner D, Khan S, Gupta V, Lindstrom R, Mazzoli A, Rozwadowski M, Braun TM, Ghosh M, **Forger DB**, Choi SW and Tewari M High-frequency temperature monitoring and computational analysis enables early detection of febrile adverse events in hematologic cancer patients *Cancer Cell* 39 (2021) 1167.

Fang Y, **Forger DB**, Frank E, Sen S and Goldstein C Day-to-day variability in sleep parameters and depression risk: a prospective cohort study of training physicians *NPJ Digital Medicine* 4 (2021) 1-9.

Cheng P, Walch O, Huang Y Mayer C, Sagong C, Cuamatzi Castelan A, Burgess HJ, Roth T, **Forger DB** and Drake CL Predicting circadian misalignment with wearable technology: validation of wrist-worn actigraphy and photometry in night shift workers *Sleep* 44 (2021) zsaal80.

Christensen S, Huang Y, Walch OJ, **Forger DB** Optimal adjustment of the human circadian clock in the real world *PLOS Computational Biology* 16 (2020), e1008445.

Hannay KM, **Forger DB** and Booth V Seasonality and light phase-resetting in the mammalian circadian rhythm *Scientific Reports* 10 (2020) 19506.

Cochran AL, Nieser KJ, **Forger DB**, Zollner S and McInnis MG Gene Set Enrichment with Mathematical Biology (GEMB) *Gigascience* 9 (2020) 1-11.

Gilpin W, Huang Y, **Forger DB** Learning dynamics from large biological datasets: machine learning meets systems biology *Current Opinion in Systems Biology* 22 (2020) 1-7.

**Forger DB**, Walch O Wearables have arrived. Let's make something of it *Current Opinion in Systems Biology* 24 (2020) 155-156.

Walch O, Huang Y, **Forger D** Goldstein C Sleep stage prediction with raw acceleration and photoplethysmography heart rate data derived from a consumer wearable device, *Sleep* 42 (2019) zsz180.

Hannay KM, Booth V, **Forger DB** Macroscopic Models for Human Circadian Rhythms, *Journal of Biological Rhythms* 34 (2019), 658.

Huang Y, Bowman C, Walch O, **Forger DB** Phase Estimation from Noisy Data with Gaps, *2019 13th International conference on Sampling Theory and Applications (SampTA)*, Bordeaux, 2019.

Hannay KM, **Forger DB**, Booth V Macroscopic models for networks of coupled biological oscillators *Science Advances* 4 (2018) e1701047.

Narasimamurthy R, Hunt SR, Lu Y, Fustin JM, Okamura H, Partch CL, **Forger DB**, Kim JK Virshup DM CKI $\delta/\epsilon$  protein kinase primes the PER2 circadian phosphoswitch *PNAS* 115 (2018) 5986.

Cochran AL, Schultz A, McInnis MG, **Forger DB** Testing frameworks for personalizing bipolar disorder. *Translational Psychiatry* 8 (2018) 36.

McInnis MG, Assari S, Kamali M, Ryan K, Langenecker SA, Saunders EFH, Versha K, Evans S, O'Shea KS, Mower Provost E, Marshall D, **Forger DB**, Deldin P, Zoellner S; Prechter Bipolar Clinical Research Collaborative Cohort Profile: The Heinz C. Prechter Longitudinal Study of Bipolar Disorder. *International Journal of Epidemiology* 47 (2017) 28.

Cochran AL, Schultz A, McInnis MG, **Forger DB** A Comparison of Mathematical Models of Mood in Bipolar Disorder in *Computational Neurology and Psychiatry* (Springer) (2017) 315.

Hughes ME, ..., **Forger DB**, ... Hogenesch JB Guidelines for Genome-Scale Analysis of Biological Rhythms *Journal of Biological Rhythms* 32 (2017) 380.

Stinchcombe AR, Mouland JW, Wong KY, Lucas RJ and **Forger DB** Multiplexing visual signals in the SCN *Cell Reports* 6 (2017) 1418.

Mouland JW, Stinchcombe AR, **Forger DB**, Brown TM and Lucas RJ Responses to spatial contrast in the mouse suprachiasmatic nuclei *Current Biology* 27 (2017) 1633.



Paul J, DeWoskin D, McMeekin M, Colwell RM, **Forger DB** and Gamble KL, GSK3 regulation of persistent Na<sup>+</sup> current encodes daily rhythms of excitability *Nature Communications* 14(2016) 13470.

Stinchcombe A, **Forger DB** An efficient method for simulation of noisy coupled multi-dimensional oscillators *Journal of Computational Physics* 321 (2016) 932.

Cochran AL, McInnis M, **Forger DB** Data-driven classification of bipolar I disorder from longitudinal course of mood *Translational Psychiatry* 6 (2016) e912.

Walch OJ, Cochran A and **Forger DB** A global quantification of “normal” sleep schedules using smartphone data *Science Advances* 2 (2016) e1501705.

Shlizerman E, Phillips-Portillo J, **Forger DB** and Reppert SM Neural integration underlying a time-compensated sun compass in the migratory monarch butterfly *Cell Reports* 15 (2016) 683.

Zhou M, Kim JK, Eng GWL, **Forger DB** and Virshup DM A Period2 phosphoswitch regulates and temperature compensates circadian Period *Molecular Cell* 60 (2015) 77.

Walch OJ, Zhang LS, Reifler AN, Dolikian ME, **Forger DB** and Wong KY Characterizing and modeling the intrinsic light response of rat ganglion cell photoreceptors. *Journal of Neurophysiology* 114 (2015) 2955.

Hannay KM, Booth V and **Forger DB** Collective phase response curves for heterogeneous coupled oscillators. *Phys Rev E* 92 (2015) 022923.

DeWoskin D, Myung J, Belle MD, Piggins HD, Takumi T and **Forger DB** Distinct roles for GABA across multiple timescales in mammalian circadian timekeeping *PNAS* 112 (2015) E2911.

Myung J, Hong S, DeWoskin D, De Schutter E, **Forger DB** and Takumi T GABA-mediated repulsive coupling between circadian clock neurons encodes seasonal time. *PNAS* 112 (2015) E2920.

Bodova K, Paydarfar D, **Forger DB** Characterizing Spiking in Noisy Type II Neurons *Journal of Theoretical Biology*, 365 (2015) 40.

Serkh K, **Forger DB** Optimal Schedules of Light Exposure for Minimum-time Reentrainment of the Human Circadian System *PLoS Computational Biology*, 10 (2014) e1003523.

Goriki A, Hatanaka F, Myung J, Kim JK, Yoritaka T, Tanoue S, Abe T, Kiyonari H, Fujimoto K, Kato Y, Todo T, Matsubara A, **Forger DB** and Takumi T A novel protein, CHRONO, functions as a core component of the mammalian circadian clock *PLoS Biology* 15 (2014) e1001839.

Dewoskin D, Geng W, Stinchcombe A, and **Forger DB** It's not the parts, but how they interact that determines the behavior of circadian rhythms across scales and organisms *Royal Society Interface Focus* 4 (2014) 20130076.

Diekmann CO, Belle MD, Irwin RP, Allen CN, Piggins HD and **Forger DB** Causes and

Consequences of Hyperexcitation in Central Clock Neurons *PLoS Computational Biology* 9 (2013) e1003196

Kim JK, **Forger DB**, Marconi M, Wood D, Doran A Wager T, Chang C, Walton KM Modeling and validating chronic pharmacological manipulation of circadian rhythms *CPT Pharmacometrics and Systems Pharmacology* 17 (2013) e57

Fotiadis P, **Forger DB** Modeling the Effects of the Circadian Clock on Cardiac Electrophysiology *J. Biol. Rhythms* 28 (2013) 69.

Kim JK, **Forger DB** On the Existence and Uniqueness of Biological Clock Models Matching Experimental Data *SIAM J. Appl. Math.* 72 (2012) 1842.

Kim JK, **Forger DB** A Mechanism for Robust Circadian Timekeeping *Molecular Systems Biology* (2012) 8:630.

Clay J, **Forger DB**, Paydarfar D Ionic Mechanism Underlying Optimal Stimuli for Neuronal Excitation, *PLoS One* (2012) 7(9):e45983.

**Forger DB** Paydarfar D, Clay JR Optimal Stimulus Shapes for Neuronal Excitation *PLoS Computational Biology* 7 (2011) e1002089.

**Forger DB** Signal Processing in Cellular Clocks *PNAS* (2011), 108 (2011) 4281-5.

Fleshner M, Booth V, **Forger DB** Diniz Behn CG Multiple Signals from the suprachiasmatic nucleus are required for circadian regulation of sleep-wake behavior in the nocturnal rat, *Philosophical Transactions of the Royal Society A* 369 (2011) 3855.

Yamada YR, **Forger DB** Multiscale Complexity in the Mammalian Circadian Clock *Curr. Opinion Genes Dev* 20 (2010) 626. (Review).

Ko CH, Yamada YR, Welsh DK, Buhr ED, Liu AC, Zhang EE, Ralph MR, Kay SA, **Forger DB**, Takahashi JS, Emergence of noise-induced oscillations in the central circadian pacemaker *PLoS Biology* 8 (2010) e1000513.

Chang DE, Leung S, Atkinson MR, Reifler A **Forger DB**, Ninfa AJ Building Biological Memory by Linking Positive Feedback Loops *PNAS*, 107 (2010) 175-180.

Belle M.D.C., Diekman C.O., **Forger D.B.** and Piggins H.D., Temporal Electrical Silencing in the Mammalian Circadian Clock *Science* 326 (2009) 281-4.

Diekman CO, **Forger DB** Clustering Predicted by an Electrophysiological Model of the Suprachiasmatic Nucleus, *Journal of Biological Rhythms*, 24 (2009) 322-33.

Dean DA, **Forger DB** and Klerman EB Taking the Lag out of Jet Lag through Model Based Schedule Design. *PLoS Computational Biology* (2009) 5(6).

Virshup DM, **Forger DB** Keeping the Beat in the Rising Heat *Cell* (2009) 137 602-4 (Preview).

Clay JR, Paydarfar D and **Forger DB** A Simple Modification of the Hodgkin & Huxley Equations explains Type 3 Excitability in Squid Giant Axons, *J Royal Society Interface* 5 (2008) 1421-8.

Conrad E, Mayo AE, Ninfa AJ and **Forger DB** Rate constants rather than biochemical mechanism determine behavior of genetic clocks *J Royal Society Interface* 5 (2008) S9-15.

Virshup DM, Eide EJ, **Forger DB**, Gallego M, and Harnish EV Reversible protein phosphorylation regulates circadian rhythms *Cold Spring Harbor Symposium on Quantitative Biology* 72 (2007) 413-20.

Sim CK and **Forger DB** Modeling the Electrophysiology of Suprachiasmatic Nucleus Neurons, *J. Biol. Rhythms* 22 (2007) 445-453.

Virshup, DM and **Forger DB** After hours keeps clock researchers CRYing Overtime. *Cell* 129 (2007) 857-859 (Preview).

**Forger DB**, Gonze D, Virshup DM and Welsh DK Beyond Intuitive Modeling: Combining Biophysical Models with Innovative Experiments to Move the Circadian Clock Field, *Journal of Biological Rhythms* 22 (2007) 200-210 (Review).

Paydarfar D, **Forger DB**, and Clay JR Noisy Inputs and the Induction of On-Off Switching Behavior in a Neuronal Pacemaker. *J Neurophysiol.*, 96 (2006) 3338-3348.

Gallego M, Eide EJ, Woolf MF, Virshup DM and **Forger DB**. An opposite role for tau in circadian rhythms revealed by mathematical modeling, *PNAS* 103 (2006) 10618-23.

**Forger DB**, Drapeau M, Collins B, and Blau J, A new model for circadian clock research? *Molecular Systems Biology* (News and Views) msb4100019-E1 (2005)

Indic P, **Forger DB**, Dean DA, Brown EN, Kronauer RE and Jewett ME Comparison of the Amplitude Recovery Dynamics of Two Limit Cycle Oscillator Models of the Human Circadian Pacemaker. *Chronobiology International*, 22 (2005) 613-629.

**Forger DB** and Peskin CS, Stochastic Simulation of the Mammalian Circadian Clock, *PNAS*, 102 (2005) 321-324.

**Forger DB** and Paydarfar D, Starting, Stopping and Resetting Biological Oscillators: In Search of Optimum Perturbations, *Journal of Theoretical Biology*, 230 (2004) 521-532.

**Forger DB** and Peskin CS, Model Based Conjectures on Mammalian Clock

Controversies, *Journal of Theoretical Biology*, 230 (2004) 533-539.

**Forger DB** and Peskin CS, A Detailed Predictive Model of the Mammalian Circadian Clock, *PNAS*, 100 (2003) 14806-14811.

**Forger DB**, Dean DA, Gurdziel K, Leloup J-C, Lee C, von Gall C, Etchegaray J-P, Kronauer RE, Goldbeter A, Peskin CS, Jewett ME and Weaver DR, Development and Validation of Computational Models for Mammalian Circadian Oscillators, *Omics*, 7 (2003) 387-400.

**Forger DB** and Kronauer RE, Reconciling Mathematical Models of Biological Clocks by Averaging on Approximate Manifolds, *SIAM J. Appl. Math.* 62 (2002) 1281-1296.

**Forger DB**, Jewett ME and Kronauer RE A Simpler Model of the Human Circadian Pacemaker, *J. Biol. Rhythms* 14 (1999) 532-537.

Kronauer RE, **Forger DB** and Jewett ME Quantifying Human Circadian Pacemaker Response to Brief, Extended and repeated Light Stimuli over the Phototopic Range, *J. Biol. Rhythms* 14 (1999) 500-515.

Jewett ME, **Forger DB** and Kronauer RE Revised Limit Cycle Oscillator Model of Human Circadian Pacemaker, *J. Biol. Rhythms* 14 (1999) 493-499.

#### *Book chapters*

**Forger DB**, Walch O Monitoring free-living circadian physiology Elsevier book chapter (2023)

Cochran AL, Schultz A, McInnis MG and **Forger DB** A comparison of mathematical models of mood in Bipolar Disorder *Computational Neurology and Psychiatry* (2017)

Ninfa AJ, Atkinson MR, **Forger DB**, Atkins S, Arps D, Selinsky S, Court D, Perry N and Mayo AE A Synthetic Biology Approach to Understanding Biological Oscillations: Developing a Genetic Clock for Escherichia coli in Bacterial Circadian Programs, Ditty et al. (2009)

#### *Meeting abstracts (most not listed)*

Paydarfar, D; **Forger, DB**; Clay, JR. Control of transitions between repetitive firing and quiescence by stochastic stimulation of squid axons with membrane bistability  
Conference: Scientific Meeting of the Physiological-Society Location: UNIV BRISTOL, BRISTOL, ENGLAND Date: SEP 05-07, 2001 Sponsor(s): Physiolog Soc  
Source: JOURNAL OF PHYSIOLOGY-LONDON Volume: 536 Supplement: S Pages: 120P-120P Published: NOV 2001

## **PHD STUDENT AND POSTDOCTORAL MENTORING**

Term Assistant Professors/Post-Doctoral Fellows and their following job placement:

Emery Conrad Manager and Research Scientist, Quantlab Financial  
Richard Yamada American Mathematical Society Public Policy Fellowship  
Cecilia Diniz-Behn (Co-Mentor Booth) Tenure Track Assistant Professor, Mathematics Department, Colorado School of Mines  
Weihua Geng (Co-Mentor Krasny) Tenure Track Assistant Professor, Mathematics Department, Southern Methodist University  
Adam Stinchcombe Tenure Track Assistant Professor, Mathematics Department, University of Toronto  
Amy Cochran Tenure Track Assistant Professor, University of Wisconsin, Madison  
Clark Bowman Tenure Track Assistant Professor, Hamilton College  
Jeffrey Dunworth Lecturer Michigan Mathematics  
Jonathan Tyler Data Scientist Sema4  
Dae Wook Kim Sogang University  
Ruby Kim (Current)

PhD Students and their following job placement:

Casey Diekman 2010 (Co-advisors Vijay Nair and KP Unnikrishnan) Tenure Track Assistant Professor, New Jersey Institute of Technology  
Nicholas Perry 2011 (Co-advisor Ninfa) Post-doctoral Fellowship, Timp Lab, Notre Dame  
Jae Kyoung Kim 2013 (Co-advisor Booth) Post-doctoral Fellowship, Mathematical Bioscience Institute, Currently Tenure Track Assistant Professor at KAIST (winner of the Sumner Myers Award and the Outstanding Teaching Award)  
Daniel DeWoskin 2015 (Co-advisor Schnell) Arthur J. Krener Assistant Professor of Mathematics, UC Davis (inaugural winner of the Peter Smereka Prize and winner of the Golden Stapler Prize)  
Olivia Walch 2016 (Co-advisor Wong) 2CN Fellow, University of Michigan CEO Arcascope  
Kevin Hannay 2017 (Co-advisor Booth) Tenure Track Assistant Professor, Mathematics Department, Schreiner University  
Yining Lu 2018 (Co-advisor Lubensky) Quantitative Researcher, Akuna Capital  
Ningyuan Wang (Co-advisor Booth) 2021 Google  
Yitong Huang (Dartmouth external advisor) 2021 Post-doctoral Fellowship Northwestern, Tenure Track Faculty member Smith College Mathematics  
Caleb Mayer (Co-advisor Choi) Post-doctoral Fellowship Stanford (Winner of Smereka Prize)  
Christina Athanasouli (Co-advisor Booth) Post-doctoral Fellowship Georgia Tech  
Alexander Ginsburg (Co-advisor Booth) Post-doctoral Fellowship University of Utah  
Guanhua Sun (Co-advisor Watson) Current  
Madelyn Cruz (Co-advisor Mashour) Current