

Tanya L. Leise

Department of Mathematics & Statistics
Amherst College
Amherst, MA 01002

tleise@amherst.edu
<http://www.amherst.edu/~tleise/>
(413)542-5411

Education

Ph.D. Texas A&M University, in Mathematics, December 1998.

M.S. Texas A&M University, in Mathematics, May 1995.

B.S. Stanford University, in Mathematics with Honors, June 1993.

Current Position: Associate Professor of Mathematics and Chair of the Department of Mathematics and Statistics, Amherst College.

Research Interests: Mathematical modeling (particularly biomathematics), applied time-frequency analysis including Fourier and wavelet transforms, and coupled nonlinear biological oscillators.

Refereed Research Publications

- A. Azzi, J. Evans, T. Leise, J. Myung, T. Takumi, A. Davidson, and S.A. Brown (2017). *Network Dynamics Mediate Circadian Clock Plasticity*, *Neuron*, in press.
- H. Jansen, T. Leise, G. Stenhouse, K. Pigeon, W. Kasworm, J. Teisberg, T. Radandt, R. Dallmann, S. Brown, and C.T. Robbins (2016). *The bear circadian clock doesn't 'sleep' during winter dormancy*, *Frontiers in Zoology* 13:42.
- L. Roberts, T. Leise, and T. Holmes (2016). *Functional contributions of strong and weak oscillators to synchrony and light-shifted phase dynamics*, *Journal of Biological Rhythms* 31:337-51.
- J. Evans, T. Leise, O. Castanon-Cervantes, A. Davidson (2015). *Neural correlates of individual differences in circadian behaviour*, *Proc. R. Soc. B* 282:20150769.
- J. Evans, T.-C. Suen, B. Callif, A. Mitchell, O. Castanon-Cervantes, K. Baker, I. Kloehn, K. Baba, B. Teubner, J. Ehlen, K. Paul, T. Bartness, G. Tosini, T. Leise, and A. Davidson (2015). *Shell neurons of the master circadian clock coordinate the phase of tissue clocks throughout the brain and body*, *BMC Biology* 13:43.
- L. Roberts, T. Leise, T. Noguchi, A. Galschiodt, J. Houl, D. Welsh, and T. Holmes (2015). *Light evokes rapid circadian network oscillator desynchrony followed by gradual phase retuning of synchrony*, *Current Biology* 25:858-67.
- E. Manoogian, T. Leise, and E. Bittman (2015). *Phase resetting in duper hamsters: Specificity to photic zeitgebers and circadian phase*, *Journal of Biological Rhythms* 30:129-143.
- C.J. Guenther, M.E. Luitje, L.A. Pyle, P.C. Molyneux, J.K. Yu[†], A.S. Li[†], T.L. Leise, and M. Harrington (2014). *Circadian rhythms of PER2::LUC in individual primary mouse hepatocytes and cultures*, *PLoS ONE* 9:e87573.
- J. Evans, T. Leise, O. Castanon-Cervantes, A. Davidson (2013). *Dynamic interactions mediated by non-redundant signaling mechanisms couple circadian clock neurons*, *Neuron* 80:973-83.
- T. Leise (2013). *Wavelet analysis of circadian and ultradian behavioral rhythms*, *Journal of Circadian Rhythms* 11:Article 5.
- T. Leise, M. Harrington, P. Molyneux, I. Song, H. Queenan, E. Zimmerman, G. Lall, and S. Biello (2013). *Voluntary exercise can strengthen the circadian system in aged mice*, *AGE* 35:2137-52.
- T. Leise, P. Indic, M.J. Paul, and W.J. Schwartz (2013). *Wavelet meets actogram*, *Journal of Biological Rhythms* 28:62-68.

[†] Amherst College undergraduate co-author.

- A. Cohen, T. Leise, and D. K. Welsh (2012). *Bayesian statistical analysis of circadian time series*, Journal of Theoretical Biology 314:182-191.
- M. Sellix, J. Evans, T. Leise, O. Castanon-Cervantes, D. Hill, P. DeLisser, G. Block, M. Menaker, and A. Davidson (2012). *Aging differentially affects the re-entrainment response of central and peripheral circadian oscillators*, Journal of Neuroscience 32:16193-16202.
- T. Leise, C. Wang, P. Gitis, and D. K. Welsh (2012). *Persistent cell-autonomous circadian oscillations in fibroblasts revealed by six-week single-cell imaging of PER2::LUC bioluminescence*, PLoS ONE 7(3): e33334.
- T. Leise and M.E. Harrington (2011). *Wavelet-based time series analysis of circadian rhythms*, Journal of Biological Rhythms 26:454-463.
- J. A. Evans, T. Leise, O. Castanon-Cervantes, A. Davidson (2011). *Intrinsic regulation of spatiotemporal organization within the suprachiasmatic nucleus*, PLoS ONE 6:e15869.
- T. Leise, J. R. Walton, and Y. Gorb (2010). *A boundary integral method for a dynamic, transient mode I crack problem with viscoelastic cohesive zone*, Int. J. Fracture 162:69-76.
- A.J. Davidson, O. Castanon-Cervantes, T. Leise, P. Molyneux, and M. Harrington (2009; Epub 2008). *Visualizing jet lag in the mouse suprachiasmatic nucleus and peripheral circadian timing system*, European Journal of Neuroscience 29(1):171-180.
- T. Leise, J. R. Walton, and Y. Gorb (2008). *Reconsidering the boundary conditions for a dynamic, transient mode I crack problem*, Journal of Mechanics of Materials and Structures 3(9):1797-1807.
- T. Leise and E. Moin[†] (2007). *A mathematical model of the Drosophila circadian clock with emphasis on post-translational mechanisms*, Journal of Theoretical Biology 28:48-63.
- T. Leise and Hava Siegelmann (2006). *Dynamics of a multistage circadian system*, Journal of Biological Rhythms 21(4):314-323.
- T. Leise (2005). *A general solution method for an anti-plane shear crack dynamically accelerating along a bimaterial interface*, J. Mech. Phys. Solids 53(3):639-653.
- T. Leise and Jay R. Walton (2004). *An analytical and numerical study of a dynamically accelerating semi-infinite crack in a viscoelastic material*, Int. J. Fracture 127(2):101-117.
- T. Leise and J. R. Walton (2003). *A method for solving dynamically accelerating crack problems in linear viscoelasticity*, SIAM J. Applied Math 64(1):94-107.
- T. Leise and J. R. Walton (2001). *Dynamically accelerating cracks part 2: A finite length mode III crack in elastic material*, Quart. Appl. Math. 59(4):601-614.
- T. Leise and J. R. Walton (2001). *A general method for solving dynamically accelerating multiple co-linear cracks*, Int. J. Fracture 111(1):1-16.
- Robert Finn and T. Leise (1994). *On the canonical proboscis*, Zeit. Anal. Anwend 13(3):443-462.

Other Refereed Publications

- K. Bryan and T. Leise (2013). *Making do with less: An introduction to compressed sensing*, SIAM Review 55(3):547-566.
- K. Bryan and T. Leise (2010). *Impedance imaging, inverse problems, and Harry Potter's cloak*, SIAM Review 52(2):359-377.
- M. Catalano, T. Leise, and T. Pfaff (2009). *Measuring energy inequity: Integration and the Gini coefficient*, Numeracy 2(2):Article 4.
- T. Leise and Andrew L. Cohen (2007). *Nonlinear oscillators at our fingertips*, American Mathematical Monthly 114(1):14-28.
- T. Leise (2007). *As the planimeter's wheel rolls*, The College Mathematics Journal 38(1):24-31.

- K. Bryan and T. Leise (2006). *The \$25,000,000,000 eigenvector: the linear algebra behind Google*, SIAM Review 48(3):569-581.

Chapters and other Invited Contributions

- T. Leise (2015). *Wavelet-based analysis of circadian behavioral rhythms*. In: Seghal, Amita (editor), *Circadian Rhythms and Biological Clocks: Methods in Enzymology Volume 551*, Academic Press.
- K. Bryan and T. Leise (2015). *Cloaking*. In: Higham, Nick (editor), *The Princeton Companion to Applied Mathematics*, Princeton University Press.
- E. Bittman and T. Leise (2009). *Multi-oscillatory circadian systems*. In: Binder, M.D., Hirokawa, N., Windhorst, U. (eds), *Encyclopedia of Neuroscience*, Springer, Berlin.

Grants

- Co-PI with Sheila Jaswal and Amy Wagaman (for Amherst College) on NSF award DBI-1129152; UBM-Institutional-Collaborative Research: Four-College Biomathematics Consortium, 2011-15.
Director of Clare Booth Luce grant to support research by undergraduate women at Amherst College in the physical sciences, computer science, and mathematical sciences, 2014-17.

Honors and Awards

- Lazerowitz Lecturer, Amherst College (2011-2012).
- Trustee-Faculty Fellowship, Amherst College (2010-11).
- Lester R. Ford Award (2008), given by the Mathematical Association of America for a noteworthy expository paper in the *American Mathematical Monthly*, *Nonlinear oscillators at our fingertips*.
- Association of Women in Mathematics Travel Grant (2004).
- ExxonMobil Project NExT Fellow (Mathematical Association of America, 2000-01).
- Guseman Prize in Mathematics, for achievement in research and academics (Texas A&M, 1998).
- Firestone Medal for Excellence in Research (Stanford University, 1993).
- Deans' Award for Excellence in Academic Achievement (Stanford University, 1993).

Thesis Students

- Rebecca Danning `16: Social network analysis of friend networks (co-winner of Breusch Prize).
- Namyi Kang `15: Modeling of a decision-making process.
- Shanghai Li `14: Analysis and modeling of the circadian clock network in the SCN.
- David Ressler `13E: Heuristic algorithms for combinatorial auctions.
- Risalat Khan `13: Agent-based modeling in environmental studies.
- Dang Trinh `12: Analysis of financial time series.
- Sam Schiavone `10: Mathematics of electromagnetic cloaking.
- Andrey Tagarev `10: Neural networks and speech recognition.
- Liana Medina-Rios: Modeling of hepatitis C treatment, Mount Holyoke College, 2009.

Research With Undergraduates

- Alex Santos `19 and Julia Vann `19: Dual analysis of PER2 and Ca²⁺ recordings, summer 2016.
- Sarah Teichman `18: Analysis of eye-tracking data for a decision-making process, summer 2015.
- Jennifer Cain `18 and Jia Liang `17: Network model of the *Drosophila* circadian clock, summer 2015.
- Yen Nhi Truong Vu `17: Image processing of circadian data, fall 2014.
- Shelly Tang `17, Melody Owen `17, Jeanne Lee `16, and Ilya Kiselev `16: Analysis and modeling of the circadian clock, summer 2014.
- Sharon Santana (Smith `14): Biomath Fellow, user interface for imaging analysis, 2013-14.
- Alex Li `14 and Jimmy Yu `15: Analysis of circadian data (funded by Biomath grant), summer 2013.

Winthrop Harvey `13: Analysis of circadian data (funded by Biomath grant), spring 2012.
 Tak Cynthia Chio `12: Circadian modeling and phase response curves, summer 2012.
 Yordanka Kovacheva `12 and Rose Weisshaar `11: Wavelet analysis of circadian rhythms, joint project with Mary Harrington (Psychology, Smith) and her students, summer 2010.
 Eunjung Park `10 and Yordanka Kovacheva `12: Modeling circadian aftereffects, summer 2009.
 Stephen Oloo `09: Vehicle routing problem with pickups and deliveries, summer 2008.
 Elisabeth Baseman `11: Aftereffects in the circadian period of cockroaches, interterm 2008.
 Simon Townsend `09: Modeling the molecular clock mechanism of *Drosophila*, summer 2007.
 Emily Moin `09: Modeling the molecular clock mechanism of *Drosophila*, summer 2006.
 Qingsi Zhu `08: Coupled nonlinear oscillators and mammalian circadian rhythms, summer 2006.

Amherst College Committee Membership and Other Service

- Committee on Priorities and Resources, 2015-present.
- Science Faculty Steering Committee, 2015-present.
- Technology Committee, 2013-14.
- Committee on Discipline, 2010-13.
- Orientation Committee, 2009-10.
- Environmental Studies Steering Committee, 2009-10.
- CCE Faculty Advisory Committee, 2007-08.
- Co-organizer of Workshop on Teaching, Career, & Life for New Faculty, 2014-present.

Departmental Duties, Amherst College Department of Mathematics

- Department chair, July 2015-July 2017.
- Math colloquia organizer, 2008-10 and 2011-12 academic years.
- Math comprehensive exam director, 2009-10 and 2013-4.
- Math graders organizer, 2010-16.
- Library representative for the mathematics department, 2009-10.
- Advisor of math majors and undeclared students (regularly participate in orientation advising).
- MAA student club advisor, 2008-09 and 2011-12.
- Minute-taker for math department meetings, 2007-09.

Fellowships

- 8/01-11/01 Sloan Foundation Pre-Tenure Leave Fellowship,
 Department of Mathematics, Rose-Hulman Institute of Technology.
- 9/94-8/98 National Science Foundation Graduate Research Fellowship,
 Department of Mathematics, Texas A&M University.
- 9/93-8/94 Lechner Merit Fellowship,
 Department of Mathematics, Texas A&M University.

Appointments

- 7/13-present Department of Mathematics and Statistics, **Amherst College**.
Associate Professor: Teach 4 courses per year, including calculus, vector calculus, linear algebra, Fourier and wavelet analysis, differential equations (emphasis on nonlinear dynamics), and mathematical modeling.
- 7/07-6/13 Department of Mathematics, **Amherst College**.
Assistant Professor: Taught 4 courses per year.
- 7/04-6/07 Department of Mathematics and Computer Science, **Amherst College**.
Visiting Assistant Professor: Taught 4 courses per year.
- 9/99-6/04 Department of Mathematics, **Rose-Hulman Institute of Technology**.

Assistant Professor: Taught eight courses per year..

- 9/98-5/99 Department of Mathematics, **Indiana University**.
Visiting Lecturer: Taught three sections of finite mathematics (fall semester) and one section of calculus (spring semester), 85 students per section.
- 6/97-7/97 Department of Mathematics, **Texas A&M University**.
Lecturer: Taught business calculus, class size 40.

Other Affiliations

- Associate member of the Neuroscience and Behavior Program at UMass-Amherst.
- Active participant in the Five Colleges Biological Clocks Group Journal Club.
- Affiliated faculty member of the Environmental Studies program at Amherst College.

Professional Service

- Member of Editorial Board for the *College Mathematics Journal*.
- Member of AWM Committee on Committees (2/1/2014-17; chair starting 2/1/16).
- Member of MAA Committee on Halmos-Ford Awards (7/1/2014-18; chair starting 7/1/15).
- Co-chair of the AMS-ASA-AWM-IMS-MAA-NCTM-SIAM Joint Committee on Women in the Mathematical Sciences (2/1/2011-14).
- Co-editor of the *Media Highlights* column in the *College Mathematics Journal* since 2010.
- Reviewer for PNAS, the *College Mathematics Journal*, the *Journal of Theoretical Biology*, *PLoS One*, and the *Journal of Biological Rhythms*, among others.

Community Engagement Work

- Four Numbers Game and Prague Clock Sequences, Flying Cloud Institute Young Women in Science Program, August 2, 2016.
- Developed service-learning program in which Math 5/6 students work with children at Fort River Elementary School on math skills. I began the program in 2007-08, which was successfully continued by other instructors for several subsequent years.
- Supervised student research project (Stephen Oloo '09 during summer 2008) to explore options for improved scheduling of CCE vans.
- Supervised my Fall 2008 Math 14 class in development of a mathematical model for the forest surrounding the Quabbin Reservoir, to be used as part of an immersive educational game (spearheaded by Scott Payne).

Courses Taught at Amherst College

Courses that I introduced to the curriculum are marked with an asterisk.

As an associate professor of mathematics

Fall 2016	Math 150* Math 284*	Mathematics of Voting and Elections Numerical Analysis
Spring 2016	Math 140 Math 365	Mathematical Modeling Stochastic Processes
Fall 2015	Math 211 Math 320	Multivariable Calculus Wavelets and Fourier Analysis
Fall 2014	Math 140 Math 211 Math 390	Mathematical Modeling Multivariable Calculus Partial Differential Equations
Spring 2014	Math 272 Math 365*	Linear Algebra With Applications Stochastic Processes
Fall 2013	FYS 102* Math 320 Math 390	Voting and Elections: A Mathematical Perspective Wavelets and Fourier Analysis Partial Differential Equations

As an assistant professor of mathematics

Spring 2013	Math 260 Math 272 Math 390	Topics in Differential Equations Linear Algebra With Applications Geological Modeling With PDEs
Fall 2012	Math 140 Math 211 Math 490	Mathematical Modeling Multivariable Calculus Flux Balance Analysis
Spring 2012	Math 272 Math 450	Linear Algebra With Applications Functions of a Real Variable
Fall 2011	Math 211 Math 320 Math 390	Multivariable Calculus Wavelets and Fourier Analysis Applied DEs for Finance
Spring 2010	Math 22 Math 42	Linear Algebra With Applications Functions of a Real Variable
Fall 2009	Math 13 Math 19	Multivariable Calculus Wavelets and Fourier Analysis
Spring 2009	Math 20 Math 22 Math 98	Topics in Differential Equations Linear Algebra With Applications Topics in Modeling
Fall 2008	Math 13 Math 14*	Multivariable Calculus Mathematical Modeling
Spring 2008	Math 6 Math 22 Math 98	Calculus With Elementary Functions Linear Algebra With Applications Topics in ODEs and PDEs
Fall 2007	Math 5 Math 19	Calculus With Algebra Wavelets and Fourier Analysis

As a visiting assistant professor of mathematics

Spring 2007	Math 20 Math 22	Topics in Differential Equations Linear Algebra With Applications
Fall 2006	Math 5 Math 13	Calculus With Algebra Multivariable Calculus
Spring 2006	Math 13 Math 22*	Multivariable Calculus Linear Algebra With Applications
Fall 2005	Math 13 Math 19*	Multivariable Calculus Wavelets and Fourier Analysis
Spring 2005	Math 13 Math 16 Math 98	Multivariable Calculus Chaotic Dynamical Systems Data Mining
Fall 2004	Math 13 Math 25	Multivariable Calculus Linear Algebra

Invited Presentations

- Agent-Based Modeling in the Classroom*, International Congress on Agent Computing, George Mason University, November 30, 2016.
- Assessing the Coherence of Coupled Oscillations*, 6th Annual Center for Circadian Biology Symposium, UC San Diego, February 26, 2015.
- Wavelet-Based Analysis of Circadian Oscillators*, Frontiers in Applied and Computational Mathematics, New Jersey Institute of Technology, May 22, 2014.
- The Mathematics Behind Circadian Rhythms*, Mathematics Department, Smith College, September 13, 2012.
- Analyzing Our Internal Circadian Clocks*, Lazerowitz Lecture, Amherst College, April 19, 2012.
- Introduction to Compressed Sensing*, Mathematics Department, Colby College, March 5, 2012.
- Analysis of Stochastic Variability in PER2::LUC Fibroblast Oscillations*, Division of Sleep Medicine at the Harvard Medical School, January 11, 2012.
- Coupled oscillators: Joggers, fireflies, and finger coordination*, MOSAIC M-cast (broadcast via web: http://www.causeweb.org/wiki/mosaic/index.php/Main_Page), December 2, 2011.
- Applying Wavelet Transforms to Circadian Data*, Third World Congress of Chronobiology, Puebla, Mexico, May 9, 2011.
- Wavelet Analysis of Circadian Oscillations*, Workshop on Circadian Clocks in Plants and Fungi, Mathematical Biosciences Institute at Ohio State, October 28, 2010.
- Wavelet Analysis of Circadian Rhythms and Jet Lag*, SUM Series, North Carolina State University, September 29, 2010.
- Dirichlet-to-Neumann Maps and Dynamic Fracture Mechanics*, UMass-Amherst Applied Analysis and Computation Seminar, April 21, 2009.
- Mathematical Modeling of the Quabbin Reservoir (2 one-hour presentations)*, Climate Change Conference at The Williston Northampton School, March 31, 2009.
- Modeling Circadian Rhythms*, Schupf Seminar, Amherst College, December 3, 2008.
- Pi Mu Epsilon Honor Society induction speaker, Manhattan College, April 17, 2008.
- The Linear Algebra Behind Google's PageRank*, Mathematics Seminar, Bentley College (Waltham, MA), October 18, 2006; Holy Cross College (Worcester, MA), March 28, 2007; Middlebury College (Middlebury, VT), October 2, 2007; and St. Mary's University of Minnesota (Winona, MN), October 8, 2007.
- Dynamically Accelerating Cracks in Elastic and Viscoelastic Materials*, Engineering Mechanics Department, University of Nebraska-Lincoln, August 29, 2006.
- An Analysis of the Dynamic Transient Propagation of a Mode I Crack-Tip Cohesive Zone*, U.S. Army Research Laboratory/University of Nebraska Semiannual Review Meeting, March 5, 2006 in San Antonio.
- Dynamics of a Multistage Circadian System*, October 27, 2005, Smith College Math Seminar, and November 1, 2005, UMass-Amherst Applied Analysis and Computation Seminar.
- Dynamics of Biological Oscillators*, April 6, 2005, to the Mount Holyoke College Math Club.
- A Solution Method for Dynamically Accelerating Cracks in Viscoelastic Materials and Elastic Bimaterials*, in minisymposium on fracture at the SIAM Conference on Mathematical Aspects of Material Science, May 23-26, 2004 in Los Angeles.

Selected Contributed Presentations

Wavelet Analysis of Circadian and Ultradian Behavioral Rhythms (poster), July 17, 2013, Gordon Conference on Chronobiology, Newport, Rhode Island.

Undergraduate Research in Wavelets and Circadian Rhythms, January 6, 2011, MAA Session on Wavelets in Undergraduate Education, Joint Mathematics Meetings, New Orleans.

A Mathematical Model of Circadian Aftereffects (poster), July 21, 2009, Gordon Conference on Chronobiology, Newport, Rhode Island.

A Mathematical Model of the Drosophila Circadian Clock (poster), May 7, 2007, Gordon Conference on Chronobiology, Aussois, France.

Modeling the Dynamics of a Multistage Circadian System (poster), August 3, 2006, SIAM Life Sciences Conferences, Raleigh, NC.

Dynamics of a Multistage Circadian System (poster), May 21, 2006, Society for Research on Biological Rhythms Biennial Meeting, Sandestin, FL.

Modeling the Molecular Mechanisms of Circadian Rhythms and Their Response to Light, January 14, 2006 AMS/MAA Joint Meetings, San Antonio.

Phase Transitions in Coupled Nonlinear Oscillators, January 6, 2005, Projects and Demos That Enhance a DE Course, 2005 AMS/MAA Joint Meetings, Atlanta.

Workshops and Short Courses Attended:

AMS Chairs Workshop, Joint Math Meetings January 2017, Atlanta, GA.

Amherst College Faculty Writing Seminar, Fall Semester 2014.

MAA Minicourse on *A dynamical systems approach to the differential equations course*, January 2012, Joint Math Meetings, Boston, MA.

AMS Short Course on Markov Chains and Mixing Times, January 2010, Joint Math Meetings, San Francisco.

MAA Minicourse on Game Theory, January 2009, Joint Math Meetings, Washington, DC.

MAA Minicourse on Mathematics of Voting, August 2008, MAA MathFest, Madison, WI.

Mathematics of Social Justice Workshop, Middlebury College, Middlebury, VT, June 20-23, 2007, organized by Priscilla Bremser.

NSF Chautauqua Course “Circadian Biology: From Clock Genes and Cellular Rhythms to Sleep Regulation,” May 11-13, 2005, Harvard University, organized by J.W. Hastings, Charles A. Czeisler, and Steven W. Lockley.

AMS Short Course on Computerized Tomography, January 3-4, 2005, AMS/MAA Joint Meetings, Atlanta.

MAA Minicourse on Financial Mathematics, January 5, 2005, AMS/MAA Joint Meetings, Atlanta.

MAA Short Course on the History of Mathematical Technologies, January 5-6, 2004, at the 2004 AMS/MAA Joint Meetings, Phoenix.

MAA Minicourse on Visual Linear Algebra, January 18 and 20, 2003, at the 2003 AMS/MAA Joint Meetings, Baltimore.

Project NExT Workshops (New Experiences in Teaching) and an MAA Minicourse on Teaching Statistics with Active Learning, January 11-13, 2001, at the 2001 Joint Math Meetings, New Orleans.