

Tanya L. Leise

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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: Assistant Professor of Mathematics, Amherst College.

Research Interests: Mathematical modeling, differential equations, integral transforms, mathematical biology, and coupled nonlinear oscillators.

Refereed Research Publications

- T. Leise and M.E. Harrington (2011). *Wavelet-based time series analysis of circadian rhythms*, J. Biol. 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). *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.

* Amherst College undergraduate co-author

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 (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.

E. Bittman and T. Leise (2008). *Multi-oscillatory circadian systems*. In: Binder, M.D., Hirokawa, N., Windhorst, U. (eds), Encyclopedia of Neuroscience, Springer, Berlin.

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 \$20,000,000 eigenvector: the linear algebra behind Google*, SIAM Review 48(3):569-581.

Manuscripts

T. Leise, C. Wang, P. Gitis, and D. K. Welsh. Persistent circadian oscillations in fibroblasts revealed by long recordings, submitted.

K. Bryan and T. Leise. Making do with less: An introduction to compressed sensing, under revision.

A. Cohen, T. Leise, and D. K. Welsh. Bayesian statistical analysis of circadian time series, in preparation.

Research With Undergraduates

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.

Thesis Students

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.

Grant Activity

Co-PI with Sheila Jaswal and Amy Wagaman on NSF award DBI-1129152; UBM- Institutional-Collaborative Research: The Four-College Biomath Consortium.

Amherst College Committee Membership

- Committee on Discipline, 2010-present.
- Orientation Committee, 2009-1020.
- Environmental Studies Steering Committee, 2009-present.
- Science Planning Committee, 2008.
- CCE Faculty Advisory Committee, 2007-08.

Courses Taught at Amherst College

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

As an assistant professor of mathematics

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

Departmental Duties, Amherst College Department of Mathematics

Math colloquia organizer, 2008-10 and 2011-12 academic years.

Math comprehensive exam director, 2009-10.

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.

Recorder for math department meetings, 2007-09.

Consultant Activity

Consultant for U.S. Army Research Laboratory/University of Nebraska Lincoln, “An Analysis of the Dynamic Transient Propagation of a Mode I Crack-Tip Cohesive Zone” (2005-2008) and “Analysis of Wave Propagation in Nonlinear Elastic and Viscoelastic Materials With Application to Brain Trauma From Blast Wave Impact” (2008).

Honors and Awards

- 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).

Community Engagement Work

Participant in NSF-funded Western Massachusetts Mathematics Partnership, as member of Teacher Preparation working group.

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 has been successfully continued by other instructors in 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 aimed at children in secondary schools in public school districts to increase their interest in science and math careers. As part of this project, I have met with middle school science teachers in the Holyoke, Quabbin Regional, and Amherst Regional school districts. Scott Payne is seeking funding for this initiative.

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

- 7/07-present Department of Mathematics, **Amherst College**.
Assistant 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.
- 7/04-6/07 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, with typically 15-25 students per class, including calculus, vector calculus, ordinary differential equations, linear algebra, statistics, mathematical modeling, and boundary value problems (PDEs). I was also the course coordinator for two freshman and sophomore multi-section courses and the faculty advisor for 3rd year math majors.
- 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, and affiliated faculty member of the Environmental Studies program at Amherst College.

Professional Service

- Member of Editorial Board for the *College Mathematics Journal*.
- Member (and co-chair starting 2/1/2011) of the AMS-ASA-AWM-IMS-MAA-NCTM-SIAM Joint Committee on Women in the Mathematical Sciences.
- Member of Committee on the Participation of Women (Mathematics Association of America)
- Regular contributor to and co-editor of the *Media Highlights* column in the *College Mathematics Journal*.
- Member of Advisory Board for Rebellion Research (founded by Amherst College alumni).
- Served on two review panels for the National Science Foundation.
- Reviewer for *Mathematics Magazine*, the *College Mathematics Journal*, the *Journal of Theoretical Biology*, *PLoS One*, and the *Journal of Biological Rhythms*, among others.
- Co-organizer of MAA Contributed Paper Session on Mathematical Modeling in the Classroom, JMM-Baltimore 2003 (with Brian Winkel and Amy Radunskaya).
- Co-organizer of the 2001 Rose-Hulman Undergraduate Mathematics Conference (with David Finn).

Invited Presentations

- Analysis of stochastic variability in PER2::LUC fibroblast oscillations*, Division of Sleep Medicine at the Harvard Medical School, January 11, 2012.
- Coupled oscillators: Juggers, 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 (two hour-long 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.

Contributed Presentations

- 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:

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.