

LIH-ING WU ROEGER

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EDUCATION

Ph.D. in Mathematics Purdue University, West Lafayette, Indiana, 2000.
Advisors: Zhilan Feng and Fabio Milner.

M.S. in Applied Mathematics National Tsing Hua University, Hsinchu, Taiwan, 1991.
Advisor: Sze-Bi Hsu.

B.S. in Mathematics National Taiwan University, Taipei, Taiwan, 1988.

PROFESSIONAL EXPERIENCE

Associate Professor Department of Mathematics and Statistics, Texas Tech University, 2010–present

Assistant Professor Department of Mathematics and Statistics, Texas Tech University, 2004–2010

Visiting Scholar National Center for Theoretical Sciences, Hsinchu, Taiwan, summers 2005–2008

Visiting Assistant Professor Department of Mathematics and Statistics, Texas Tech University, 2002–2004

Assistant Professor Berea College, Berea, Kentucky, 2000–2002

AREAS OF INTEREST

Dynamical systems, differential equations, difference equations, nonstandard finite difference schemes, mathematical epidemiology, and mathematical ecology.

AWARDS AND GRANTS

1. PI (Co-PI: S. Jang), NSF grant proposal *2010 Red Raider Mini-Symposium: Mathematical Modeling in Population Biology and Epidemiology*, Feb 2010. Amount: \$32,000. Pending.
2. Co-PI, MAA PREP Workshop *Mathematical Modeling with Applications to Biology*, Aug 2009. NSF grant DUE-0817071. Amount: \$21,000.
3. AWM Travel Grant for SIAM (Society for Industrial and Applied Mathematics) conference in May 2009, Oct 2008. Amount: \$1,100.
4. Co-PI, MAA PREP Workshop *Mathematical Modeling with Applications to Biology*, Aug 2008. NSF grant DUE-0817071. Amount: \$20,700.
5. Travel grant for attending the 11th JDEA meeting in Kyoto University, Kyoto, Japan, July 2006. Amount: \$1,000.
6. PI, Research Enhancement Fund, College of Arts and Sciences, Texas Tech University, April 2005. Amount: \$4,000.

7. Room and board scholarship to attend the conference *Discrete Dynamical Systems and their Applications to Population Dynamics*, the Rocky Mountain Mathematics Consortium, Laramie, Wyoming, July 2003. Amount: \$400.
8. Travel grant to attend the Joint Mathematics Meetings, the Association for Women in Mathematics, Baltimore, Maryland, January 2003. Amount: \$785.
9. Monetary support to participate at the Workshop on Epidemiology Modeling, DIMACS, Rutgers University, Piscataway, New Jersey, June 2002. Amount: \$400.
10. Berea College Undergraduate Research Grant, Berea College, Berea, Kentucky, summer 2001. Amount: \$16,200.
11. Travel grant to attend the Annual SIAM Conference, the Association for Women in Mathematics, Atlanta, Georgia, May 1999. Amount: \$750.

PUBLICATIONS

Submitted and under review:

1. C. P. Bhunu, W. Garira, S. Mushayabasa, J. M. Tchuente, L.-I. Wu Roeger, Tuberculosis transmission model incorporating case detection and treatment strategy.
2. L.-I. Wu Roeger. Exact finite-difference method for second-order linear equations with constant coefficients.

Published/Accepted:

1. L.-I. Wu Roeger. Dynamically consistent finite difference schemes for the differential equation $dy/dt = b_n y^n + b_{n-1} y^{n-1} + \dots + b_1 y + b_0$. To appear.
2. L.-I. Wu Roeger and R. Gelca. Dynamically consistent discrete-time Lotka-Volterra competition models. *Discrete and Continuous Dynamical Systems*, Dedicated to the 7th AIMS Conference, Arlington, TX. Edited by X. Hou, X. Lu, A. Miranville, J. Su, and J. Zhu. **Supplement 2009**: 650–658, 2009.
3. S.-B. Hsu and L.-I. Wu Roeger. Heteroclinic cycles in the chemostat models and the winnerless competition principle. *J. Math. Anal. Appl.*, **360**: 599–608, 2009.
4. L.-I. Wu Roeger, Z. Feng, and C. Castillo-Chavez. Modelling TB and HIV Coinfections. *Mathematical Biosciences and Engineering*, **6**: 817–839, 2009.
5. J. A. D. Appleby, A. Rodkina, and L.-I. Wu Roeger. Stability of a limit cycle for a planar system with stochastic perturbations. *Functional Differential Equations*, **16**: 73–91, 2009.
6. W. Hernandez-Padilla and L.-I. Wu Roeger. Local stability of a discrete competition model derived from a nonstandard numerical method. *Advanced Studies in Pure Mathematics, ICDEA2006*, **53**: 283–290, 2009.
7. L.-I. Wu Roeger. General nonstandard finite-difference schemes for differential equations with three fixed-points. *Computers and Mathematics with Applications*, **57**: 379–383, 2009.
8. L.-I. Wu Roeger. Nonstandard finite difference schemes for differential equations with $n + 1$ distinct fixed-points. *Journal of Difference Equations and Applications*, **15**: 133–151, 2009.
9. L.-I. Wu Roeger. Exact finite-difference schemes for two-dimensional linear systems with constant coefficients. *Journal of Computational and Applied Mathematics*, **219**: 102–109, 2008.

10. L.-I. Wu Roeger. Periodic solutions preserved by nonstandard finite-difference schemes for Lotka-Volterra system: a different approach. *Journal of Difference Equations and Applications*, **14**: 481–493, 2008.
11. L.-I. Wu Roeger. Exact nonstandard finite-difference methods for a linear system—the case of centers. *Journal of Difference Equations and Applications*, **14**: 381–389, 2008.
12. L.-I. Wu Roeger. Dynamically consistent discrete Lotka-Volterra competition models derived from nonstandard finite-difference schemes. *Discrete and Continuous Dynamical Systems Series B*, **9**: 415–429, 2008.
13. L.-I. Wu Roeger and R. E. Mickens. Exact finite-difference schemes for first order differential equations having three fixed points. *Journal of Difference Equations and Applications*, **13**: 1179–1185, 2007.
14. S.-B. Hsu and L.-I. Wu Roeger. The final size of a SARS epidemic model without quarantine. *Journal of Mathematical Analysis and Applications*, **333**: 557–566, 2007.
15. J. M. Cushing, S. M. Henson, and L.-I. Wu Roeger. Coexistence of competing juvenile-adult structured populations. *Journal of Biological Dynamics*, **1**: 201–231, 2007.
16. L.-I. Wu Roeger and R. W. Barnard. Preservation of local dynamics when applying central difference methods: application to SIR model. *Journal of Difference Equations and Applications*, **13**: 333–340, 2007.
17. L.-I. Wu Roeger. Nonstandard finite-difference schemes for the Lotka-Volterra systems: generalization of Mickens’s method. *Journal of Difference Equations and Applications*, **12**: 937–948, 2006.
18. L.-I. Wu Roeger. Nonstandard discretization methods on Lotka-Volterra differential equations. A chapter in *Advances in the Applications of Nonstandard Finite Difference Schemes*, edited by R. E. Mickens (Clark Atlanta University, USA), World Scientific, 2005.
19. L.-I. Wu Roeger. A nonstandard discretization method for Lotka-Volterra models that preserves periodic solutions. *Journal of Difference Equations and Applications*, **11**: 721–733, 2005.
20. L.-I. Wu Roeger. Discrete May-Leonard competition models II. *Discrete and Continuous Dynamical Systems—Series B*, **5**: 841–860, 2005.
21. L.-I. Wu Roeger. Hopf bifurcations in discrete May-Leonard competition models. *Canadian Applied Mathematics Quarterly*, **11**: 175–194, 2005.
22. L.-I. Wu Roeger. Discrete May-Leonard competition models III. *Journal of Difference Equations and Applications*, **10**: 773–790, 2004.
23. L.-I. Wu Roeger. Local stability of Euler’s and Kahan’s methods. *Journal of Difference Equations and Applications*, **10**: 601–614, 2004.
24. K. W. Blayneh and L.-I. Wu Roeger. Asymptotic dynamics of an age-structured host-parasitoid model. *Applicable Analysis*, **83**: 787–798, 2004.
25. L.-I. Wu Roeger and L. J. S. Allen. Discrete May-Leonard competition models. *Journal of Difference Equations and Applications*, **10**: 77–98, 2004.
26. L.-I. Wu and Z. Feng. Homoclinic bifurcation in an SIQR model for childhood diseases. *J. Diff. Equations*, **168**: 150–167, 2000.
27. C.-W. Chi, S.-B. Hsu, and L.-I. Wu, On the asymmetric May-Leonard model of three competing species. *SIAM J. Appl. Math.*, **58**: 211–226, 1998.

PROFESSIONAL PRESENTATIONS

1. Joint Mathematics Meetings, San Francisco, California, January 13–16, 2010. Co-organizer for AMS Special Session on Recent Advances in Mathematical Biology and Epidemiology, *Dynamically consistent discrete-time Lotka-Volterra models*.
2. SIAM Conference on Applications of Dynamical Systems (DS09), Snowbird, Utah, May 17–21, 2009. Contributed presentation, *Discrete Competition Equations that are Dynamically Consistent with Lotka-Volterra Equations*.
3. Differential Equation and Application in Ecology and Epidemiology Conference at Purdue University on the occasion of H. Thieme's 60th birthday, West Lafayette, Indiana, Dec 2008. Invited presentation, *Competition of two species for two limited resources with one species mediated by parasites*.
4. Fifth World Congress of Nonlinear Analysts (WCNA-2008), Hyatt Grand Cypress Resort, Orlando, Florida, July 2008. Co-organizer for a special session, *Dynamically consistent discrete Lotka-Volterra competition models*.
5. AIMS Seventh International Conference on Dynamical Systems, Differential Equations and Applications, Arlington, Texas, May 2008. Invited presentation, *Dynamically consistent discrete Lotka-Volterra competition models*.
6. Joint Mathematics Meetings, San Diego, California, January 2008. Co-organizer for AMS Special Session on Recent Advances in Mathematical Biology and Epidemiology, *Competition of two host species for two limited resources with one species mediated by parasites*.
7. Mathematical Modeling and Analysis of Populations in Biological Systems, Tucson, Arizona, October 2007. Invited presentation, *Dynamically consistent discrete monotone competition models by nonstandard finite difference schemes*.
8. AMS Spring Western Section Meeting, University of Arizona, Tucson, Arizona, April 2007. Invited presentation, *Winnerless competition in consumer-resource interaction models*.
9. Workshop on the Mathematics of Global Public Health, Tempe, Arizona, March 2007. Contributed presentation, *The impact of HIV infection on tuberculosis*.
10. Joint Mathematics Meetings, New Orleans, Louisiana, January 2007. Co-organizer for AMS Special Session on Recent Advances in Mathematical Biology and Epidemiology, *The final size of a SARS epidemic model without quarantine*.
11. The 11th International Conference on Difference Equations and Applications, Kyoto University, Kyoto, Japan, July 2006. Contributed presentation, *Nonstandard finite-difference schemes for the Lotka-Volterra systems: generalization of Mickens's method*.
12. Joint Mathematics Meetings, San Antonio, Texas, January 2006. Co-organizer for AMS Special Session on Recent Advances in Mathematical Biology and Epidemiology, *Winnerless Competition in Consumer-resource Interaction Models*.
13. American Mathematical Society Section Meeting, Lubbock, Texas, April 2005. Co-organizer for a special session, *A Class of Nonstandard Symplectic Discretization Methods for Lotka-Volterra Systems*.
14. SIAM-SEAS, Charleston, South Carolina, March 2005. Invited presentation, *Discrete time May-Leonard competition models—annual plants competition*.
15. The 9th International Conference on Difference Equations and Applications, University of Southern California, Los Angeles, August 2004. Invited presentation, *A Nonstandard Discretization Method for Lotka-Volterra Models that Preserves Periodic Solutions*.

16. International Conference On Nonlinear Dynamics And Evolution Equations, Memorial University of Newfoundland, St. John's, Newfoundland and Labrador, Canada, July 2004. Invited presentation, *The impact of HIV infection on tuberculosis*.
17. Joint Mathematics Meetings, Phoenix, Arizona, January 2004. Invited presentation, *Discrete May-Leonard competition model—the Ricker type*.
18. Thirty-third Annual Lloyd Roeling Mathematics Conference, the University of Louisiana at Lafayette, Louisiana, October 2003. Invited presentation, *A nonstandard discretization method that preserves stability*.
19. American Mathematical Society Joint Central and Western Section Meeting, Boulder, Colorado, October 2003. Invited presentation, *The impact of HIV infection on tuberculosis*.
20. Discrete Dynamical Systems and Their Applications to Population Dynamics Workshop, University of Wyoming, Laramie, Wyoming, July 2003. Contributed presentation, *Continuous and discrete May-Leonard competition models*.
21. Fourth Geoffrey J. Butler Memorial Conference, Edmonton, Alberta, Canada, June 2003. Contributed presentation, *Continuous and discrete May-Leonard competition models*.
22. Joint Mathematics Meetings, Association for Women in Mathematics Workshop, Baltimore, Maryland, January 2003—one among 8 recent PhDs selected and funded by AWM. Contributed presentation, *The impact of HIV infection on tuberculosis*.
23. Joint Mathematics Meetings, MAA session on Initiating and Sustaining Undergraduate Research Projects and Programs, Baltimore, Maryland, January 2003. Contributed presentation, *The impact of delaying flu vaccine on public health*.
24. Joint Mathematics Meetings, New Orleans, Louisiana, January 2001. Invited presentation, *“Homoclinic bifurcation in an SIQR model for childhood diseases”*.
25. Institute for Mathematics and its Applications Workshop, Minneapolis, Minnesota, May 1999. Poster presentation, *On bifurcations of codimension greater than two arising from a childhood disease model*.
26. Association for Women in Mathematics Workshop, Atlanta, Georgia, May 1999—one among 15 graduate students selected and funded by AWM. Poster presentation, *On bifurcations of codimension greater than two arising from a childhood disease model*.
27. Joint Mathematics Meetings, San Antonio, Texas, January 1999. Contributed presentation. *On the asymmetric May-Leonard model of three competing species*.

COLLOQUIA AND SEMINARS

1. Texas Tech University, Department of Mathematics and Statistics Colloquium, October 2009.
2. Texas Tech University, Biomathematics Seminar, Lubbock, Texas, February 2009.
3. Texas Tech University, Applied Mathematics Seminar, Lubbock, Texas, October 2008.
4. Texas Tech University, Biomathematics Seminar, Lubbock, Texas, September 2008.
5. Texas Tech University, Biomathematics Seminar, Lubbock, Texas, March 2008.
6. Texas Tech University, Biomathematics Seminar, Lubbock, Texas, November 2007.
7. National Chiao Tung University, Colloquium, Hsinchu, Taiwan, June 2007.

8. National Central University, Colloquium, Taoyuan County, Taiwan, June 2007.
9. National Center for Theoretical Sciences, NCTS Seminar in Mathematical Biology, Hsinchu, Taiwan, June 2007.
10. Texas Tech University, Biomathematics Seminar, Lubbock, Texas, February 2007.
11. Texas Tech University, Control Theory Seminar, Lubbock, Texas, April 2006.
12. Texas Tech University, Applied Math/Biomathematics Seminar, Lubbock, Texas, September 2005.
13. National Center for Theoretical Sciences, Colloquium, Hsinchu, Taiwan, July 2005.
14. National Donghwa University, Colloquium, Hualien, Taiwan, June 2005.
15. National Center for Theoretical Sciences, Mathematical Biology Seminar, Hsinchu, Taiwan, June 2005.
16. Texas Tech University, Applied Math/Biomathematics Seminar, Lubbock, Texas, September 2004.
17. Purdue University, Mathematical Biology and Dynamical System Seminar, West Lafayette, Indiana, September 2004.
18. Texas Tech University, Colloquium, Lubbock, Texas, January 2004.
19. Texas Tech University, Applied Math/Biomathematics Seminar, Lubbock, Texas, February 2003.
20. Texas Tech University, Biomathematics Seminar, Lubbock, Texas, September 2002.
21. Texas Tech University, Biomathematics Seminar, Lubbock, Texas, August 2002.

STUDENT RESEARCH DIRECTED

- Master's student:
 - Glenn Lahodny Jr., May 2010.
 - Wendy Hernandez-Padilla, May 2007.
- Undergraduate students:
 - Lance Bryant, Berea College, summer 2001.
 - Michael Samuel, Berea College, summer 2001.

UNIVERSITY SERVICES

1. Faculty Senator, Texas Tech University, fall 2007–2010.
2. Co-organizer, Biomathematics Seminar, fall 2008 and spring 2009.
3. Invited speaker, Summer Math Academy, Texas Tech University, June 2008.
4. Student workshop speaker, Emmy Noether High School Mathematics Day, Texas Tech University, May 2008, "Having a sphere of fun—paper plates folding."
5. Committee member, Emmy Noether High School Day Committee, spring 2007–2008.
6. Student workshop speaker, Emmy Noether High School Mathematics Day, Texas Tech University, May 2007, "Let's have fund with paper plates."

7. Student research poster faculty evaluator, Texas Tech University Student Research Days, Texas Tech University, April 2007.
8. Advisor, SIAM Student Chapter, Texas Tech University, fall 2005–spring 2007.
9. Organizer, Biomathematics Seminar, fall 2006 and spring 2007.
10. Invited speaker, SIAM Mini-Symposium, Texas Tech University, Oct 2006.
11. Guest lecturer, REU Summer Program, Texas Tech University, July 2006.
12. Guest lecturer, Dr C. Martin’s evening class, Texas Tech University, spring 2006.
13. Guest lecturer, Dr L. Allen’s evening class, Texas Tech University, fall 2005.
14. Teacher workshop speaker, Emmy Noether High School Mathematics Day, Texas Tech University, May 2005.
15. Student research presentation judge, SIAM Graduate Student Research Day, Texas Tech University, March 2005.
16. Guest lecturer, Summer Mathematics Academy, Texas Tech University, June 2004.
17. Student workshop speaker, Emmy Noether High School Mathematics Day, Texas Tech University, Lubbock, TX, May 2004.
18. Co-organizer, Biomathematics Seminar, Texas Tech University, Lubbock, Texas, fall 2003 and spring 2004.
19. Student workshop speaker, Emmy Noether High School Mathematics Day, Texas Tech University, Lubbock, Texas, May 2003.
20. Co-organizer, Biomathematics Seminar, Texas Tech University, Lubbock, Texas, spring 2003.
21. Committee member, Pre-Medical Program Committee, Berea College, 2001–2002.
22. Academic advisor, Berea College, 2001–2002.
23. Advisor, Pi Mu Epsilon Mathematics Honorary Society, Berea College Chapter, 2000–2002.

PROFESSIONAL AND COMMUNITY SERVICES

1. Co-organizer (with L. Allen and S. Jang), MAA PREP Workshop *Mathematical Modeling in Population Biology and Epidemiology*, June 2010.
2. Co-organizer (with L. Allen and S. Jang), MAA PREP Workshop *Mathematical Modeling in Population Biology and Epidemiology*, July 2009.
3. Reviewer for the book *Calculus for the Life Sciences: A Modeling Approach* by J. L. Cornette and R. A. Ackerman, fall 2007.
4. Guest editor for the *Journal of Biological Dynamics*, spring 2007.
5. Reviewer, *Mathematical Reviews*, since fall 2005.
6. Referee for the following journals:
 - *Mathematics and Computers in Simulation*
 - *Mathematical Biosciences and Engineering*

- Journal of Biological Dynamics
- Journal of Mathematical Analysis and Applications
- Taiwanese Journal of Mathematics
- Discrete and Continuous Dynamical Systems-Series B
- Journal of Theoretical Biology
- Journal of Difference Equations and Applications
- Proceedings of the Fourth G. J. Butler Memorial Conference in Differential Equations

7. Judge, Exxon Mobil Texas Science and Engineering Fair, spring 2004.

8. Reviewer for the book *A Biologists Survival Guide to Mathematics*, summer 2003.

CONFERENCE AND SESSION ORGANIZER

- Co-organized with O. Akman, L. J. S. Allen, T. D. Comar, and S. R.-J. Jang a special session at the Joint Mathematics Meetings, San Diego, CA, January 2010.
- Co-organized with K. Blayneh a special session at the Fifth World Congress of Nonlinear Analysts WCNA 2008, Orlando, Florida, July 2–9, 2008.
- Co-organized with L. J. S. Allen and S. R.-J. Jang a special session at the Joint Mathematics Meetings, San Diego, CA, January 2008.
- Co-organized with L. J. S. Allen and S. R.-J. Jang a special session at the Joint Mathematics Meetings, New Orleans, LA, January 2007.
- Co-organized with L. J. S. Allen and S. R.-J. Jang a special session at the Joint Mathematics Meetings, San Antonio, TX, January 2006.
- Co-organized with L. J. S. Allen and S. R.-J. Jang a special session at the AMS Central Section Meeting, Lubbock, TX, April 2005.

PROFESSIONAL MEMBERSHIPS

- ISDE, International Society of Difference Equations
- MAA, Mathematical Association of America
- AMS, American Mathematical Society