

Kathleen R. Fowler

Clarkson University
Department of Mathematics and Computer Science
Box 5815 Potsdam, NY 13699-5815

Work Phone: (315) 268-2376
E-mail: kfowler@clarkson.edu
Website:
<http://www.clarkson.edu/~kfowler>

Educational Record

- North Carolina State University, Ph.D., Applied Mathematics, December 2003
- North Carolina State University, M.S., Computational Applied Mathematics, December 2000
- State University of New York at Plattsburgh, B.A., Mathematics (Magna Cum Laude), August 1996

Professional Record

- **Associate Professor, Clarkson University** August 2003–present
- **Visiting Academic, U.S. Army Corps of Engineers Waterways Experiment Station**, Vicksburg, MS, July 2006, July 2002, May–July 2001, June 2000, August 1999
- **GAANN Computational Science Fellow, North Carolina State University**, under the advisement of C.T. Kelley, 1998–2001
- **Research Assistant, North Carolina State University** under the advisement of C.T. Kelley, 2001–2003
- **Assistant Director and Mathematics Instructor, Huntington Learning Center**, Fayetteville, NC, 1996–1998

Fellowships and Awards

1. Tau Beta Pi Clarkson Faculty Award for Exemplary Performance in the Art of Teaching, 2009
2. Clarkson University Outstanding New Teacher Award 2005
3. Project NExT Fellow, 2003
4. GAANN Computational Science Fellowship, U.S. Department of Education, 1998–2001
5. SIAM Student Travel Award, SIAM Conference on Optimization, 2002
6. SIAM Student Travel Award, SIAM 50th Anniversary & 2002 Annual Meeting, 2002
7. SIAM Student Travel Award, SIAM Conference on Mathematical and Computational Issues in the Geosciences, 2003
8. Math Scholars Award, SUNY Plattsburgh, 1996

Research and Development Grants

Funded Proposals

1. American Institute of Mathematics (AIM) and NSF funded SQuaRE (Structured Quartet Research Ensembles) program on Derivative-Free Hybrid Optimization Methods for Solving Simulation-Based Problems in Hydrology, April 2009. The purpose of a SQuaRE is to allow a dedicated group of four to eight mathematicians to spend one to two weeks at the AIM headquarters in Palo Alto, California, working on a focused research problem.
2. American Institute of Mathematics (AIM) and NSF funded AIM Research Conference Center focused workshop on Derivative-Free Hybrid Optimization Methods for Solving Simulation-Based Problems in Hydrology (PI: K. Fowler with Dr. Genetha Gray and Dr. Owen Eslinger). This competitive program provides full funding to hold a workshop for roughly 30 participants (October 6-10, 2008 in Palo Alto, CA).
3. U.S. Army Corps of Engineers, BAA, Fully-adaptive Methods For Unsaturated Flow Problems, 9/4/07-9/3/2008, \$63,069.
4. NYS Education Department St. Lawrence County STEM Partnership, PI: Peter Turner, (Co-PI Kathleen Fowler and others), awarded \$2.4M over 3 years with \$900,000 to Clarkson University
5. NYS Education Department Science and Technology Entry Program (STEP), PI: Peter Turner, Co-PIs: Kathleen Fowler, David Wick, Mike Ramsdell, Gail Gothom, awarded \$1M over four years
6. U.S. Army Corps of Engineers Faculty Research and Engineering Program, \$5,000 + travel money: visited the hydraulics lab in Vicksburg, MS for one week to implement and test a scheme for temporal adaption in a large-scale groundwater flow simulator and outline future work, July 2006
7. Clarkson Center for the Environment Seed Grant: *Hybrid Optimization Methods for Water Resources Management*, awarded \$500 for the visit of Thomas Hemker from the TU Darmstadt, December 2006.
8. Clarkson Center for the Environment Seed Grant: *Water Supply with Seawater Intrusion*, awarded \$1,500 for summer support for undergraduate research assistant, December 2005.
9. No Child Left Behind St. Lawrence County Math-Partnership Grant (Co-PI: Kathleen Fowler and others) Amount received for 7/1/04-6/30/07: awarded \$1.7M over 3 years with \$273,476 to Clarkson.
10. NSF-AWM Mentor Travel Grant: To work with Evin Joyce Cramer at the Boeing Company, July 2004.
11. GAANN Computational Science Mini-Grant, U.S. Department of Education, March 2001, March 2000.

Unfunded Proposals

1. Strategic Environmental Research Development Program, Diffusion and Desorption of Chlorinated Solvents in Heterogeneous Media: Impact on Plume Characteristics and Behavior, submitted 3/09 (pre-proposal successful, full-proposal in review). Pi: Michelle Crimi, Co-PI: Katie Fowler.
2. NSF Math Science Partnership (MSP) Program, The STEM Partnership: Developing Teacher Leaders to Stimulate Rural Communities of Practice, submitted 2/09 and in review, PI: Susan Powers, Co-PIs, Katie Fowler and others.
3. U.S. Army Corps of Engineers, BAA, Understanding Mass Conservation with Fully-adaptive Methods For Unsaturated Flow Problems, submitted 8/2009.
4. NSF Science, Technology, Engineering, and Mathematics Talent Expansion Program (STEP) Q3 : Query-based Quality Learning to recruit and retain inquisitive STEM students, submitted 2/9/06, PI: Amy Zander, Co-PIs: Susan Powers, Christopher Robinson, Kathleen Fowler, and Dipanker Roy.
5. NSF Collaboration in Mathematical Geosciences: Collaborative Research on Multi-model, Hybrid Algorithm Approaches for Well Field Optimization, submitted 2/1/06, PI: Kathleen Fowler, Co-PI Alan Rabideau, SUNY Buffalo, Department of Civil, Structural, and Environmental Engineering.
6. DOE Early Career Principal Investigator Program in Applied Mathematics, Computer Science, and High-Performance Networks: Simulation and Optimization for Applications with Nonsmooth Models, submitted 3/05, PI: Kathleen Fowler.
7. NSF Collaboration in Mathematical Geosciences: Collaborative Research on Advances in Hydrologic Optimization, submitted 3/05, PI: Kathleen Fowler, Co-PI Alan Rabideau, SUNY Buffalo, Department of Civil, Structural, and Environmental Engineering.
8. NSF Information Technology Experiences for Students and Teachers, Integrated mathematics and Physics Information Technology, submitted 10/04, PI: Peter Turner, Co-PIs: Kathleen Fowler, David Wick, Brent Faber, Dennis Horn, Johndan Johnson-Eilola, Michael Ramsdell.
9. HP Technology for Teaching Grant Initiative, P. Turner (PI), K. Fowler (Co-PI).

Teaching

Teaching Philosophy

My intent in the classroom is to make connections to real-world applications and motivate the need and appreciation for mathematics while providing a comfortable setting for learning. I am a strong advocate of project-based learning and promote technical writing and communication across all courses I teach. I strive to ensure that students will *succeed after* leaving school, not just in my classroom.

Courses Developed

1. **MA579 Introduction to Applied Optimization**

The motivation for this course is that optimization problems arise routinely in most scientific disciplines—from designing an airline schedule to minimizing the cost to design a remediation strategy for a contaminated ground water site. In this course we focus on numerical techniques

to solve applied optimization problems of various formulations. Topics include solutions to nonlinear equations (in single and multi variables), a review of linear algebra and multivariable calculus, unconstrained and constrained optimization, black-box formulations and a glance at sampling methods, and if time allows, extra topics may include multi-objective optimization, mixed integer programming methods, and evolutionary algorithms. This course includes a computing component with MATLAB and possibly some off-the-shelf optimization packages.

The objectives are (a) to become familiar with a range of optimal design formulations and techniques appropriate for those formulations, (b) to motivate the need for efficient numerical methods for optimization problems, (c) to study these methods through implementation and analysis, (d) to become familiar with some existing software for optimization as well as write our own codes, and (e) to obtain a better understanding and appreciation for scientific computing in optimization.

2. MA726 Graduate Seminar in Applied Mathematics Communication

Students work beyond their ‘research’ area to understand and communicate ideas outside their field of expertise in applied mathematics. Students gain experience in technical communication, both written and oral. By the end of the semester, each student gains experience and improvement in delivering and critiquing a scientific talk, reviewing research articles, writing abstracts, and designing a poster. Extra topics include learning LaTeX and creating a curriculum vitae.

Students Advised

Doctor of Philosophy

1. Godfred Yamoah, Fully Adaptive Methods for Variably Saturated Flow Problems, expected graduation 200
2. Ahmad Almomani, Modelling and Simulation of Desorption in Low Permeability Media: Impact on Plume Behavior, expected graduation 2012

Doctor of Philosophy

1. Brian McClune, New Hybrid and Surrogate Techniques for Simulation-based Optimization of a Polymer Extrusion Filter, expected graduation 2009
2. Jacob Orsini, Understanding Video Games as a Learning Tool in an Introduction to Numerical Methods Course, expected graduation 2010
3. Katie Lozo, A Mathematical Modelling Approach to Assessing Teacher Leaders, expected graduation 2010

Undergraduate Researchers

1. Matthew Parno, Honors Program Thesis Advisor, expected graduation 2009, Particle Swarm Optimization with Surrogate Functions

2. Ruby Fu, Honors Program Summer Research 2008, The Effects of Heterogeneities on the Solution of Water Management Problems
3. Ryan Northrup, Honors Program Summer Research 2008, Validating an Interval Arithmetic ODE Algorithm
4. Andrew Davis, Honors Program Summer Research 2007, The Effects of Grid Resolution on the Solution of Optimal Control Problems in Water Resources and Effects of Saltwater Intrusion on a Coastal Aquifer: Henry's Problem and the Coastal Region of Hersonissos Crete
5. Scott LaLonde, McNair Scholars Program 2007, Maximizing the Performance of a Polymer Extrusion Filter via Derivative-free Optimization Methods
6. Tiffany Terpstra, McNair Scholars Program 2007, Roller Coaster Project: Integrated Mathematics and Physics Curriculum for Middle and High School Students
7. Michael Petit, Honors Program 2007, Thesis: Adaptive Implicit Temporal Integration of ODEs with Interval Computations

Publications

Appeared or accepted to appear

1. K.R. Fowler, E.W. Jenkins, S.M. LaLonde, Chris Cox, *A Simulation-based Optimization Approach to Polymer Extrusion Filter Design*, accepted to Filtration, to appear in July 2009.
2. Aiman Q. Jaradat, K. Fowler, Stefan J. Grimberg, and Thomas M. Holsen, and Rajat S. Ghosh, *Treatment of Storm Water Containing Low Levels of PCBs Using Natural Media Filtration (NMF)*, accepted to Environmental Engineering Science, 2009.
3. Aiman Q. Jaradat, K. Fowler, Stefan J. Grimberg, and Thomas M. Holsen, *Transport of Colloids and Associated Hydrophobic Organic Chemicals Through a Natural Media Filter*, Journal of Environmental Engineering, 135(1), 36-45, January 2009.
4. V. Krishnamurthy, E. Sazonov, and K. Fowler, *Effect of Time Synchronization of Wireless Sensors on Modal Analysis of Structures*, accepted to Smart Materials and Structures, doi:10.1088/0964-1726/17/5/055018, July 2008.
5. T. Hemker, K.R. Fowler, M.W. Farthing, O. Von Stryk, *A Mixed-integer Simulation-based Optimization Approach With Surrogate Functions in Water Resources Management*, accepted to appear in Optimization and Engineering, DOI: 10.1007/s11081-008-9048-0, June 2008.
6. K.R. Fowler, J.P. Reese, C.E. Kees, J.E. Dennis, Jr., C.T. Kelley, C.T. Miller, C. Audet, A.J. Booker, G. Couture, R.W. Darwin, M.W. Farthing, D.E. Finkel, J.M. Gablonsky, G. Gray, T.G. Kolda, *A Comparison of Derivative-free Optimization Methods for Water Supply and Hydraulic Capture Community Problems*, Advances in Water Resources, 31(5), 743-757, May 2008.
7. K.R. Fowler, G.A. Gray, M.S. Olufsen, *Modelling Heart Rate Regulation-Part II: Parameter Identification*, The Journal of Cardiovascular Engineering, 8(2), 109-119, April 2008.
8. J. Qian, A.R. Ferro, K.R. Fowler, *Estimating the Resuspension Rate and Residence Time of Indoor Particles*, The Journal of Air and Waste Management Association, Vol. 58, pp. 502-516, April 2008.

9. K.R. Fowler, B.M. McClune, E.W. Jenkins, C.L. Cox, B. Seyfzadeh, *Design Analysis of Polymer Filtration Using a Multi-objective Genetic Algorithm*, Separation Science and Technology, 43(4) 710-726, March 2008.
10. L.S. Mattot, S.L. Bartelt-Hunt, A.J. Rabideau, and K.R. Fowler, *Application of Heuristic Optimization Techniques and Algorithm Tuning to Multi-layered Sorptive Barrier Design*, Environmental Science & Technology, 40, 6354 - 6360, 2006.
11. K. R. Fowler, C. T. Kelley, *Pseudo-Transient Continuation for Nonsmooth Nonlinear Equations*, SIAM Journal of Numerical Analysis 43(4), pages 1385-1406, 2005.
12. K. R. Fowler, C. T. Kelley, C. T. Miller, Mark S. Reed, C. E. Kees, and Robert W. Darwin, *Solution of a Well-Field Design Problem with Implicit Filtering*, Optimization and Engineering(5) 207-234, May 2004.
13. A. Battermann, J. M. Gablonsky, A. Patrick, C. T. Kelley, K. R. Kavanagh (Fowler), T. Coffey, and C. T. Miller, *Solution of a Groundwater Flow Problem With Implicit Filtering*, Optimization and Engineering, (3), 2002, 189-199.

Submitted

1. K.R. Fowler, E.W. Jenkins, S.M. LaLonde, *Understanding the Effects of Polymer Extrusion Filter Layering Configurations Using Derivative-Free Optimization*, submitted to Optimization and Engineering, August 2008.
2. M. Parno, K. Fowler, T. Hemker, *A Framework for Particle Swarm Optimization with Surrogate Functions*, submitted to IEEE Transactions on Evolutionary Computation, July 2008.
3. M.P. Petit, K.R. Fowler, *Adaptive Implicit Temporal Integration of ODEs with Interval Computations*, submitted to Reliable Computing (in revision), October 2007.

Conference Proceedings

1. B. Zhang, K.R. Fowler, M. Grace, S. Mondal, S.J. Grimberg, *Optimization of Anaerobic Digestion Model No. 1 (ADM1): Simulation of Dairy Manure Digestion*, Proceedings of the American Society of Agricultural and Biological Engineers Annual International Meeting, Reno, Nevada, June 2009.
2. G.A. Gray, K.R. Fowler, J.D. Griffin, *A Hybrid Optimization Scheme for Solving the Hydraulic Capture Problem with an Unknown Number of Wells*, The First International Conference on Soft Computing Technology in Civil, Structural and Environmental Engineering Funchal, Madeira, Portugal 1-4 September 2009.
3. K.R. Fowler, S.M.Lalonde, E.W. Jenkins, C.L.Cox, *A Simulation-based Optimization Approach to Polymer Extrusion Filter Design*, the Proceedings of the American Filtration and Separations Society Annual Conference, (May 19-22) Valley Forge, PA 2008.
4. P.Turner, K.R. Fowler, D. Wick, M. Ramsdell, G. Gotham, E. Glasgow, C. French, *BOCES-University Partnerships as a Model for Educational Outreach: K-16 STEM Professional Development*, Proceedings for the Inaugural Math and Science Symposium, Knoxville, TN, October 2007.

5. G.A. Gray and K.R. Fowler, *Approaching the Groundwater Remediation Problem Using Multi-fidelity Optimization*, proceedings of the XVI International Conference on Computational Methods in Water Resources, Copenhagen, Denmark, June 2006.
6. T. Hemker, K.R. Fowler, and O. Van Stryk, *Derivative-Free Methods for Handling Fixed Costs in Optimal Groundwater Remediation Design*, proceedings of the XVI International Conference on Computational Methods in Water Resources, Copenhagen, Denmark, June 2006.
7. K.R. Fowler, C.T. Kelley, C.E. Kees, C.T. Miller, *A Hydraulic Capture Application for Optimal Remediation Design* Proceedings of the XV International conference on Computational Methods in Water Resources, C.T. Miller, M.W. Farthing, G.W. Gray. G.F. Pinder editors, 2004.
8. C.T. Kelley, K.R. Fowler, C.E. Kees, *Simulation of Nondifferentiable Models for Groundwater Flow and Transport* Proceedings of the XV International conference on Computational Methods in Water Resources, C.T. Miller, M.W. Farthing, G.W. Gray. G.F. Pinder editors, 2004.
9. K. R. Kavanagh (Fowler), C. T. Kelley, R. C. Berger, J. P. Hallberg, and Stacy E. Howington, *Nonsmooth Nonlinearities and Temporal Integration of Richards' Equation*. Proceedings of the XIV International Conference on Computational Methods in Water Resources, S.Majid Hassanizadeh, Ruud J. Schotting, W.G. Gray, and G.F. Pinder, editors, 2002, pp 947–954.

Conference Participation

Session Organizer

1. **Industrial Applications of Porous Media Flow**, with Lea Jenkins, SIAM Conference on Computational Science and Engineering, Miami, FL, February 2009.
2. **Surrogate Optimization Techniques for Mixed-Integer Nonlinear Problems**, with Thomas Hemker, SIAM Optimization, Boston, MA, May 2008.
3. **Optimization Applications in Porous Media Flow**, with Owen Eslinger, SIAM Conference on Computational Science and Engineering, Costa Mesa, CA, February 2007.
4. **K-12 Outreach in CSE**, with Peter Turner, SIAM conference on Computational Science and Engineering, Costa Mesa, CA, February 2007.
5. **Optimization in Water Resources**, with Alex Mayer, The 15th International Conference on Computational Methods in Water Resources, Chapel Hill, NC June 2004.
6. **The Publication Process**, panel discussion session for new faculty members with panel participants Bill Briggs, University of Boulder, CO, Jeff Scroggs, NC State University, Barbara Reynolds, Cardinal Stritch University, and Luise-Charlotte Kappe, SUNY Binghamton, The Joint Meetings in Phoenix, AZ, January 2004.

Invited Talks

1. **Optimization As a Tool for Understanding Polymer Filter Designs and Layer Configurations** SIAM Conference on Computational Science and Engineering, Miami, FL, February 2009.
2. **Assessing Polymer Extrusion Filter Performance with Gradient-Free Optimization Methods**, Lea Jenkins*, Kathleen Fowler, SIAM Optimization, Boston, MA, May 2008.
3. **Derivative-Free Benchmarking Problems from Water Resources Management**, SIAM Optimization, Boston, MA, May 2008.
4. **A Framework for Particle Swarm Optimization for Mixed-Integer Problems Using Surrogate Functions**, Matthew Parno*, Kathleen Fowler, Thomas Hemker, SIAM Optimization, Boston, MA, May 2008.
5. **Considerations in Evaluating Derivative-Free Methods for Simulation-Based Optimization Problems**, Genetha Gray*, Kathleen Fowler, SIAM Optimization, Boston, MA, May 2008.
6. **Integrated Calculus and Physics Projects Based on Roller Coaster Design**, Joint Mathematics Meetings, San Diego, California, January 2008.
7. **Selection of Parameters for Maximizing the Lifetime of a Polymer Extrusion Filter**, Second International Conference on Continuous Optimization, Hamilton, Ontario, August 2007.
8. **Some Derivative-Free Approaches to a Hydraulic Capture Benchmarking Problem**, SIAM Conference on Computational Issues in the Geosciences, Costa Mesa, CA, March 2007.
9. **Why do I have to Learn This? Real World Applications Making Connections**, co-keynote speaker, 8th Annual Regional Secondary Mathematics Conference, Ogdensburg, NY, March 2007.
10. **Derivative-Free Methods for Simulation-based Optimization in Engineering Design**, colloquium talk, Clemson University, May 2006.
11. **Derivative-Free Methods for Fixed Cost Formulations of Plume Containment Applications**, Civil and Environmental Engineering Seminar, Clarkson University, November 2006.
12. **Outreach to the K-12 Community**, SIAM Conference on Computational Science and Engineering, Orlando, FL, February 2005.
13. **A Comparison of Sampling Methods for Remediation Design**, The Graduate School on Modeling, Simulation, and Optimization, Technische Universitat Darmstadt, Germany, December 2004.
14. **Sampling Methods for Optimal Remediation Design**, The Computational Engineering Research Center, Technische Universitat Darmstadt, Germany, December 2004.
15. **A Comparison of Sampling Methods for Remediation Design**, SUNY Buffalo, Department of Civil, Structural, and Environmental Engineering, November 2004.

16. **Using Mathematics to Educate Students About Groundwater** SIAM 2004 Annual Meeting, Portland, OR, July 2004.
17. **Teaching Numerical Methods Through Projects** Joint Mathematics Meetings, Phoenix, AZ, January 2004.
18. **An Experience with Early Undergraduate Research in Modeling and Computational Mathematics** Joint Mathematics Meetings, Phoenix, AZ, January 2004.
19. **A Numerical Approach and Nonsmooth Analysis for Partially Saturated Flow in Nonuniform Porous Media** Solution Methods for Large-Scale Nonlinear Problems, Livermore, CA, August 2003.
20. **Optimal Design for Groundwater Flow and Remediation Problems** SAMSI Workshop on Simulation and Optimization, Raleigh, NC, April 2003.
21. **Implicit Temporal Integration and Preconditioner Management for Richards' Equation** SIAM 50th Anniversary & 2002 Annual Meeting, Philadelphia, PA, July 2002.
22. **Solving Groundwater Remediation Problems with Implicit Filtering** SIAM Conference on Optimization, Toronto, Canada, May 2002.
23. **Subsurface Control With Implicit Filtering** Sixth SIAM Conference on Mathematical and Computational Issues in the Geosciences, Boulder, CO, June 2001.
24. **Application and Analysis of a Heat Transport Model**, Universitat Trier, Trier, Germany, January 2001.

Contributed Talks and Poster Presentations

1. **Selecting Appropriate Hybrid-optimization Techniques for Solving the Plume Containment Problem**, G.A. Gray*, K.R. Fowler, J. Griffin, M. Taddy, XVII International Conference on Computational Methods in Water Resources, San Francisco, CA, July 2008.
2. **The Effects of Mesh Coarsening on Mass Conservation for a Fully Adaptive Implementation of Richards' Equations**, Poster, G. S. Yamoah, K.R. Fowler, O. Eslinger, C.E. Kees, J. Pettway, and S. Howington, , XVII International Conference on Computational Methods in Water Resources, San Francisco, CA, July 2008.
3. **A Simulation-based Optimization Approach to Polymer Extrusion Filter Design**, S. LaLonde, K. Fowler, L. Jenkins*, C. Cox, American Filtration Society 2008 Annual Conference and Exposition, Valley Forge, PA May 2008.
4. **A Framework for Particle Swarm Optimization with Surrogate Functions**, Matthew Parno*, Kathleen Fowler, Thomas Hemker, 10th Copper Mountain Conference on Iterative Methods, Copper Mountain, CO, April 2008.
5. **Derivative-Free Methods to Maximize the Lifetime of a Polymer Extrusion Filter**, contributed talk, SIAM Conference on Computational Science and Engineering, Costa Mesa, CA, February 2007.
6. **Adaptive Temporal Integration of ODEs with Interval Computations**, Mike Petito* and K. Fowler, SIAM Conference on Computational Science and Engineering, Costa Mesa, CA, February 2007.

7. **Plume Containment with Particle Swarm Optimization**, Matthew Parno* and K. Fowler, SIAM Conference on Computational Science and Engineering, Costa Mesa, CA, February 2007.
8. **IMPETUS for Career Success**, SIAM Conference on Computational Science and Engineering, Costa Mesa, CA, February 2007.
9. **Adaptive Temporal Integration of ODEs with Interval Computations**, poster with Mike Petito, 2006 SIAM Annual Meeting, Boston.
10. **Challenges in Modeling Variably Saturated Flow in Nonuniform Porous Media**, poster with Godfred Yamoah, Clarkson Center for the Environment Open House, February 2007.
11. **Plume Containment with Particle Swarm Optimization**, poster with Matthew Parno, Clarkson Center for the Environment Open House, February 2007.
12. **Enhancement of Mathematics with Technology and Theme-Based Learning**, National Consortium for Specialized Secondary Schools of Mathematics, Science, and Technology Expedition, St. Louis, MO, March 2005.
13. **A Hydraulic Capture Application for Optimal Remediation Design**, XV International Conference on Computational Methods in Water Resources, Chapel Hill, NC June 2004.
14. **Optimal Groundwater Remediation Design**, Eighth Copper Mountain Conference on Iterative Methods, Copper Mountain, CO, March 2004.
15. **Implicit Temporal Integration with Error Control for Richards' Equation** Seventh SIAM Conference on Mathematical and Computational Issues in the Geosciences, Austin, TX, March 2003.
16. **Implicit Temporal Integration for Richards' Equation** Seventh Copper Mountain Conference on Iterative Methods, Copper Mountain, CO, March 2002.

Professional Development

1. **American Institute of Mathematics**, Workshop on Short-term Cardiovascular Respiratory Control Mechanisms, Palo Alto, CA, November 2006.
2. **Faculty Research and Engineering Program**, Army Corps of Engineers, Waterways Experimentation Station, Vicksburg, MS, July 2006.
3. **Writing in the Disciplines Workshop**, School of Arts and Sciences, Clarkson University.
4. **Project NExT Fellow** New Experiences in Teaching July 2003–2004
This is a developmental program for new Ph.D's in the mathematical sciences and is designed to help improve teaching of undergraduate mathematics and direction of undergraduate research.
5. **AMS-MER Workshop on Excellence in Undergraduate Mathematics: Lessons Across the Curriculum**, Anchorage, Alaska, September 2003.

6. **SAMSI Associate**, Statistical and Applied Mathematical Sciences Institute, Research Triangle Park, NC, August 2002–2003
The Institute is funded by the National Science Foundation and my work contributed to the Large–Scale Computer Models for Environmental Systems program.
7. **Preparing the Professoriate**, N.C. State University, August 2000–May 2001
Co-taught MA427, Introduction to Numerical Analysis.
8. **Introduction to Using the IBM SP at NCSC**, North Carolina Supercomputing Center, September 2000.
9. **MPI, Message Passing Interface Course**, North Carolina Supercomputing Center, August 1999.

Professional Service

Professional and Honorary Societies

1. Phi Kappa Phi
2. Society for Industrial and Applied Mathematics
3. American Mathematical Society
4. Association for Women in Mathematics
5. Mathematical Association of America
6. Clarkson representative for the Consortium of Universities for the Advancement of Hydrologic Science

Peer Reviewer

1. SIAM Journal of Numerical Analysis
2. SIAM Journal of Optimization
3. Optimization and Engineering
4. Advances in Water Resources
5. Groundwater
6. Water Resources Research
7. Computational Optimization and Applications
8. Mathematical Reviews for the American Mathematical Society (AMS)

University Service

Affiliations: Clarkson Center for the Environment, Member 2003–present

Funded Invited Colloquium Speakers

1. Dr. John Dennis Jr., Noah Harding Professor Emeritus, Department of Computational and Applied Mathematics, Rice University, Fall 2004
2. Dr. Alan Rabideau, Professor, Civil, Structural, and Environmental Engineering, University of Buffalo, Fall 2005
3. Shawn Mattot, Post-doc, Civil, Structural, and Environmental Engineering, University of Buffalo Fall 2005
4. Dr. Owen Eslinger, U.S. Army Corps of Engineers Waterways Experimentation Station, Vicksburg, MS, Fall 2006
5. Thomas Hemker, TU Darmstadt, Simulation and Systems Optimization, Darmstadt, Germany Spring 2006
6. Dr. Genetha Gray, Sandia National Labs, Livermore, CA Spring 2006

Faculty Advisor for Student Groups:

Clarkson Student Chapter of the Association for Women in Mathematics

I started this chapter in 2004 primarily to promote a sense of community among mathematics major, but the meetings and activities are open to all students regardless of gender or major. The primary goals are to expose students to the world of professional mathematics, help students obtain information about careers in mathematics, and help students develop leadership skills through service to the university and community. Some of our past activities include; Peer tutoring for the Freshmen ABC exams, MATLAB and MAPLE tutorials open to the campus, Middle School Math Essay Contest to celebrate Math Awareness Month (2005, 2006, 2007, 2008), Math in Industry: a panel discussion with Dr. Kevin Vixie from Los Alamos National Labs, "Jobs in Industry: What's it all about?" by Dr. Genetha Gray (invited speaker from Sandia National Labs), social events including Num3rs nights, Casino nights, and movie nights. This year's events included creating a π -day celebration for over 70 local middle and high school students and joint movie nights with the SIAM student chapter in addition to some of the usual activities. The highlight event of the year was the first Undergraduate Reserach Symposium in Mathematics Dessert Reception. The purpose of this event was to showcase our undergraduate majors who participated in a summer research project in 2007 and to inform incoming majors about the possibilites of various REU programs.

COMAP International Contest in Mathematical Modeling 2005, 2006, 2007, 2008

I revived Clarkson's participation in COMAP in 2005 after Prof. David Powers had stopped coaching several years before. This contest challenges teams of students to clarify, analyze, and propose solutions to open-ended problems. The contest attracts diverse students and faculty advisors from over 500 institutions around the world. At Clarkson University, COMAP has attracted students from varying backgrounds and disciplines—each year there is at least one team of motivated freshmen who tend to perform extremely well. I brought one of the freshmen teams to the Mathematical Association of America's Seaway Section Spring 2005 meeting to give a contributed talk about their mathematical model of a highway toll booth system. This year, 1162 teams participated around the world and our Clarkson students performed extremely well. One team received successful completion, two teams received honorable mention, and one team earned a Meritorious Win, a placement only 13% of the teams receive. This team was made up of all freshmen.

University Committees

Member, Awards Committee, 2005
Student Affairs Focus Group, October 2003

Department Committees

Member, Undergraduate Committee, 2003-present
Member, Recruitment Committee, 2003-present
Member, Applied Math Hiring Committee, 2006, 2007

Graduate Advisory Committees

1. Lauren Sampson, MS in Mathematics, 2008
2. Babek Enayati, Ph.D Candidate in Electrical Engineering
3. Madhav Karri, Ph.D Candidate in Mechanical and Aeronautical Engineering
4. Ye Chen, Ph.D. Candidate in Mathematics
5. Chow Compoo-Inwai, Ph.D. Candidate in Electrical Engineering
6. Xunyang Shen, Ph.D. in Mathematics, 2007
7. Mehul Vora, Ph.D. in Computer Science, 2006
8. Lotten Mthombeni, Ph.D in Electrical Engineering, 2006
9. Jin Qian, MS in Civil and Environmental Engineering, 2004

Educational Outreach Activities

Background

Clarkson University is located in St. Lawrence County which comprises eighteen rural school districts. The communities served are characterized by unemployment levels above the state average, per capita income below other rural communities in upstate New York, and an astounding 25% of children living below the poverty level. Over the last few years an educational partnership between the Clarkson University and the St. Lawrence-Lewis BOCES has emerged to tackle the need for change. This partnership has resulted in the National Science Foundation GK-12 Program, the NYSED St. Lawrence Mathematics Partnership, The NYSED IMPETUS for Career Success, and the NYSED St. Lawrence STEM partnership. I have been involved with all of the above programs as well as a title-II D No Child left Behind funded partnership with the Franklin-Essex-Hamilton (FEH) BOCES. I will highlight some of the outcomes below.

1. Teacher Institutes

These week long workshops are designed for local middle and high school teachers. The focus is on professional development, improving mathematical knowledge, curriculum development, and project-based learning. Each institute includes real world applications, core mathematics, technology, and an emphasis on New York State standards.

- (a) Clarkson Summer Institute: Integrated Mathematics and Physics Projects for Middle and High Schools, July 23-27, 2007 (St. Lawrence County STEM Partnership Grant)
- (b) FEH BOCCES 2-day Teacher Institute on Theme-based Learning, July 2006

- (c) Clarkson Summer Institute on Applications and Technology to Enhance Math and Science Education, July 24-28, 2006 (St. Lawrence County MATH Partnership Grant)
 - (d) Clarkson Summer Institute on Problem Solving and Applications, August 1-5 2005 (St. Lawrence County MATH Partnership Grant)
 - (e) Clarkson Summer Institute on Mathematics with Technology, August 8-12 2005 (Title II D, with FEH BOCES)
 - (f) Clarkson Summer Institute on Enhancing Mathematics Education through Technology, August 9-12 2004 (Title II D, with FEH BOCES)
2. **Integrated Mathematics and Physics for Entry To Undergraduate STEM (IMPETUS) for Career Success: Roller Coaster Program, 2005-present**
This is a student oriented program meant to assist students in exploring higher education possibilities in the STEM disciplines. The motivating theme is the understanding of roller coaster engineering through a school year program and week long summer camp. The program provides academic support, tutoring, mentoring, career planning, as well as enriching learning activities.
3. *MATHCOUNTS co-coordinator, 2006-present*
MATHCOUNTS is a national enrichment program that promotes middle school mathematics achievement. As a co-cordinator, my activities include training and scheduling Clarkson students to help local teacher coaches prepare students for the competition, and hosting the local competitions on Clarkson campus (roughly 70 local middle school competitors).
4. *Project Challenge: The Roller Coaster Project, 2007, 2008*
This is a five week course taught on Saturdays to local high school students. The course was developed and co-taught with Dr. Peter Turner, Dr. Mike Ramsdell, and Dr. David Wick. The course provides an introductory understanding of the mathematics and physics of roller coaster design. The classwork includes the use of altimeters and motion sensors to collect data, computer labs to analyze data and web-based investigation on key features of roller coasters, and the basics of kinetic energy. The class is supported by mathematical modeling, computational methods, and pencil-and-paper activities. Students apply these ideas to a toy car 'roller coaster' travelling along a large 5 meter track whose shape can be altered to accomodate multiple hills, valleys, loops, and jump scenarios. In addition, students explore the safety and thrill factors of coaster design via the NOLIMITS software and by taking a ride in the MAXFLIGHT2002 Virtual Reality Roller Coaster that resides on Clarkson's campus.