

# Marc D. Riedel, Ph.D.

## Academic Rank

Associate Professor with Tenure, Electrical & Computer Engineering  
Graduate Faculty, Biomedical Informatics & Computational Biology  
University of Minnesota, Twin Cities

## Contact Information

address: 200 Union St. S.E.  
Minneapolis, MN 55455  
email: [mriedel@umn.edu](mailto:mriedel@umn.edu)  
tel: 612-625-6086  
cell: 612-275-9878  
fax: 612-625-4583

## Websites

Main website: <http://tinyurl.com/marc-riedel-group>  
Research: <http://tinyurl.com/marc-riedel-research>  
Papers: <http://tinyurl.com/marc-riedel-papers>

## EDUCATION

- Postdoctoral Fellow, Computation and Neural Systems, 2004–2005  
*California Institute of Technology*  
Funded by the NIH Human Genome Research Institute
- Ph.D., Electrical Engineering, 2004  
*California Institute of Technology*  
Dissertation Title: “Cyclic Combinational Circuits”  
Advisor: Jehoshua Bruck  
Committee: Yaser Abu-Mostafa, Jehoshua Bruck, Ali Hajimiri, Alain Martin, Erik Winfree, and Andrew Viterbi (external from the Viterbi School of Engineering, University of Southern California)
- M.S., Electrical Engineering, 1998  
*California Institute of Technology*
- B.Eng., Electrical Engineering, 1995  
Minor in Mathematics, 1995  
*McGill University*

## POSITIONS

- Associate Professor with Tenure, 2012–present  
Electrical and Computer Engineering  
*University of Minnesota, Twin Cities*

- Assistant Professor, 2006–2012  
Electrical and Computer Engineering  
*University of Minnesota, Twin Cities*
- Faculty Member, 2006–present  
Digital Technology Center  
*University of Minnesota, Twin Cities*
- Graduate Faculty, 2008–present  
Biomedical Informatics and Computational Biology Program  
*University of Minnesota, Twin Cities*
- Lecturer, 2004–2005  
Computation and Neural Systems  
*California Institute of Technology*
- Research and Teaching Assistant, 2001–2004  
Electrical Engineering  
*California Institute of Technology*

## HONORS AND AWARDS

- **CAREER Award** from the National Science Foundation, 2009–2014.
- Paper titled “The Synthesis of Combinational Logic to Generate Probabilities” nominated for the **IEEE/ACM William J. McCalla Best Paper Award** at the International Conference on Computer-Aided Design (ICCAD), 2009.
- **Charles H. Wilts Prize** for the Best Doctoral Research in Electrical Engineering at Caltech, 2004.
- Paper titled “The Synthesis of Cyclic Combinational Circuits” received the **Best Paper Award** at the Design Automation Conference (DAC), 2003.

## RESEARCH FUNDING

### External Sponsored Funding

- Agency: National Science Foundation  
Program: Software and Hardware Foundations  
Title: “Advanced Signal Processing with Molecular Reactions”  
Investigators: Keshab Parhi (PI) and Marc Riedel (co-PI)  
Amount: \$300,000  
Status: 2014-2017
- Agency: National Science Foundation  
Program: Software and Hardware Foundations  
Title: “Back to the Future with Printed, Flexible Electronics Design in a Post-CMOS Era when Transistor Counts Matter Again”  
Investigators: K. Bazargan (PI), D. Frisbie (co-PI), R. Harjani (co-PI), and D. Lilja (co-PI), Marc Riedel (co-PI)  
Amount: \$800,000  
Status: 2014–2017

- Agency: National Science Foundation  
Program: Software and Hardware Foundations  
Title: “Digital Yet Deliberately Random – Synthesizing Logical Computation on Stochastic Bit Streams”  
Investigators: Marc Riedel (PI), K. Bazargan (co-PI), R. Harjani (co-PI), and D. Lilja (co-PI)  
Amount: \$300,000  
Duration: 2012–2014
- Agency: National Science Foundation  
Program: Software and Hardware Foundations  
Title: “Digital Signal Processing with Biomolecular Reactions”  
Investigators: Keshab Parhi (PI) and Marc Riedel (co-PI)  
Amount: \$400,000  
Duration: 2011–2014
- Agency: National Science Foundation  
Program: **NSF CAREER Award**  
Title: “Computing with Things Small, Wet, and Random – Design Automation for Digital Computation with Nanoscale Technologies and Biological Processes”  
Investigator: Marc Riedel (PI)  
Amount: \$500,000  
Duration: 2009–2014
- Agency: National Science Foundation  
Program: Design Automation for Micro and Nano Systems  
Title: “Synthesizing Signal Processing Functions with Biochemical Reactions”  
Investigators: Keshab Parhi (PI) and Marc Riedel (co-PI)  
Amount: \$200,000  
Duration: 2009–2011
- Agency: SRC Focus Center Research Program (FCRP)  
Program: Functional Engineered Nano-Architectonics (FENA)  
Title: “The Concurrent Logical and Physical Design of Nanoscale Digital Circuits”  
Investigator: Marc Riedel (PI)  
Amount: \$325,000  
Duration: 2007–2010

### University Sources

- Agency: University of Minnesota, Digital Technology Center  
Program: Digital Technology Initiatives (DTI) Seed Grant  
Title: “Computational Method for Forward Biological Engineering”  
Investigators: Y. Kaznessis (PI), C. Schmidt-Dannert (co-PI), and M. Riedel (co-PI)  
Amount: \$97,800  
Duration: 2011–2012
- Agency: University of Minnesota  
Program: Biomedical Informatics and Computational Biology (BICB)  
Funding: Student Traineeships for Brian Fett and Adrianna Fitzgerald  
Investigator: Marc Riedel (PI)

Amount: \$78,000  
Duration: 2007–2009

## PUBLICATIONS and PRESENTATIONS

### Peer-Reviewed Journal Articles and Book Chapters

1. “Molecular Sensing and Computing Systems”  
S. Ahmad Salehi, Keshab Parhi, and Marc Riedel  
*IEEE Transactions on Molecular, Biological, and Multi-Scale Communications*, in press
2. “Chemical Reaction Networks for Computing Polynomials”  
S. Ahmad Salehi, Keshab Parhi, and Marc Riedel  
*ACS Synthetic Biology*, under revision
3. “Synthesizing Cubes to Satisfy a Given Intersection Pattern”  
Weikang Qian, Marc Riedel, and Ivo Rosenberg  
*Journal of Discrete Applied Mathematics*, Vol. 193, pp. 11–38, 2015
4. “Computation on Stochastic Bit Streams: Digital Image Processing Case Studies”  
Peng Li, David Lilja, Weikang Qian, Kia Bazargan, and Marc Riedel  
*IEEE Transactions on VLSI Systems*, Vol. 22, No. 3, pp. 449–462, 2014
5. “Logical Computation on Stochastic Bit Streams with Linear Finite State Machines”  
Peng Li, David Lilja, Weikang Qian, Marc Riedel, and Kia Bazargan  
*IEEE Transactions on Computers*, Vol. 63, No. 6., pp. 1474–1486, 2014
6. “Discrete-Time Signal Processing with DNA”  
Hua Jiang, S. Ahmad Salehi, Marc Riedel, and Keshab Parhi  
*ACS Synthetic Biology*, Vol. 2, No. 5, pp. 245–254, 2013
7. “Case Studies of Logical Computation on Stochastic Bit Streams”  
Peng Li, David Lilja, Weikang Qian, Kia Bazargan, and Marc Riedel  
*Lecture Notes in Computer Science: Power and Timing Modeling, Optimization and Simulation Workshop*,  
G. Goos, J. Hartmanis, and J. V. Leeuwen Editors, Springer, pp. 235–244, 2012
8. “Gene Regulatory Network Modeling Using Literature-Curated and High Throughput Data”  
Vishwesh Kulkarni, Reza Arastoo, Anupama Bhat, Kalyanasundaram Subramanian, Mayuresh Kothare, and Marc Riedel  
*Systems and Synthetic Biology*, Vol. 6, No. 3–4, pp. 69–77, 2012
9. “The Synthesis of Cyclic Functional Dependencies with Boolean Satisfiability”  
John Backes and Marc Riedel  
*ACM Trans. on Design Automation of Electronic Systems*, Vol. 17, No. 4, pp. 1–24, 2012
10. “Logic Synthesis for Switching Lattices”  
Mustafa Altun and Marc Riedel  
*IEEE Transactions on Computers*, Vol. 61, No. 11, pp. 1588–1600, 2012

11. “Digital Signal Processing with Molecular Reactions”  
Hua Jiang, Marc Riedel, and Keshab Parhi  
*IEEE Design & Test of Computers*, Vol. 29, No. 3, pp. 31–31, 2012
12. “Cyclic Boolean Circuits”  
Marc Riedel and Jehoshua Bruck  
*Journal of Discrete Applied Mathematics*, Vol. 160, No. 13–14, pp. 1877–1900, 2012
13. “Transforming Probabilities with Combinational Logic”  
Weikang Qian, Marc Riedel, Hongchao Zhou, and Jehoshua Bruck  
*IEEE Trans. on CAD of Integrated Circuits & Systems*, Vol. 30, No. 9, pp. 1279–1292, 2011
14. “Synthesizing Logic with Percolation in Nanoscale Lattices”  
Mustafa Altun and Marc Riedel  
*Int’l Journal of Molecular and Nanoscale Computation*, Vol. 3, No. 2, pp. 12–30, 2011
15. “Characterizing the Memory of the GAL Regulatory Network in *Saccharomyces cerevisiae*”  
Vishwesh Kulkarni, Venkatesh Kareenhalli, Ganesh Viswanathan, and Marc Riedel  
*Systems and Synthetic Biology*, Vol. 5, No. 3–4, pp. 97–104, 2011
16. “Rate-Independent Constructs for Chemical Computation”  
Philip Senum and Marc Riedel  
*PLoS ONE*, Vol. 6, Issue 6, 12 pages, 2011
17. “Uniform Approximation and Bernstein Polynomials with Coefficients in the Unit Interval”  
Weikang Qian, Marc Riedel, and Ivo Rosenberg  
*European Journal of Combinatorics*, Vol. 32, No. 3, pp. 448–463, 2011
18. “An Architecture for Fault-Tolerant Computation with Stochastic Logic”  
Weikang Qian, Xin Li, Marc Riedel, Kia Bazargan, and David Lilja  
*IEEE Transactions on Computers*, Vol. 60, No. 1, pp. 93–105, 2011
19. “Synthesizing Combinational Logic to Generate Probabilities: Theories and Algorithms”  
Weikang Qian, Marc Riedel, Kia Bazargan, and David Lilja  
*Advanced Techniques in Logic Synthesis, Optimizations and Applications*  
Sunil Khatri and Kanupriya Gulati Editors, Springer Publishing, pp. 1–28, 2011
20. “The Synthesis of Stochastic Logic for Nanoscale Digital Circuits”  
Weikang Qian, John Backes, and Marc Riedel  
*International Journal of Molecular and Nanoscale Computation*  
Vol. 1, Issue 4, pp. 39–57, 2010
21. “Computing in the RAIN: A Reliable Array of Independent Nodes”  
Vasken Bohossian, Charles Fan, P. LeMahieu, Marc Riedel, Lihao Xu, and Jehoshua Bruck  
*IEEE Transactions on Parallel and Distributed Computing*, Vol. 12, No. 2, pp. 99–114, 2001
22. “Tolerating Faults in Counting Networks”  
Marc Riedel and Jehoshua Bruck  
*Dependable Network Computing*, Dimiter Avresky, Editor  
Kluwer Academic Publishing, pp. 267–278, 2000

**Peer-Reviewed Conference Papers**

1. “Quantifying the Benefits of Polysynchronous Clocking for Stochastic Computing”  
M. Hassan Najafi, David Lilja, Marc Riedel, and Kia Bazargan  
*ACM/IEEE Design Automation Conference*, submitted, 2016
2. “Pulse Width Modulation: A Low-Cost Stream Generator for Stochastic Circuits”  
M. Hassan Najafi, David Lilja, Marc Riedel, and Kia Bazargan  
*ACM/IEEE Design Automation Conference*, submitted, 2016
3. “Polysynchronous Stochastic Circuits”  
M. Hassan Najafi, David Lilja, Marc Riedel, and Kia Bazargan  
*IEEE/ACM Asia and South Pacific Design Automation Conference*, 2016.
4. “Markov Chain Computations using Molecular Reactions”  
S. Ahmed Salehi, Marc Riedel, and Keshab Parhi  
*IEEE International Conference on Digital Signal Processing*, pp. 689–693, 2015
5. “Effect of Bit-Level Correlation in Stochastic Computing”  
Megha Parhi, Marc Riedel, and Keshab Parhi  
*IEEE International Conference on Digital Signal Processing*, pp. 463–467, 2015
6. “Asynchronous Discrete-Time Signal Processing with Molecular Reactions”  
Ahmed Salehi, Marc Riedel, and Keshab Parhi  
*Asilomar Conference on Signals, Systems, and Computers*, pp. 493–497, 2014
7. “IIR Filters Using Stochastic Arithmetic”  
Naman Saraf, Kia Bazargan, David Lilja, Marc Riedel  
*IEEE/ACM Conference on Design, Automation and Test in Europe*, pp. 1–6, 2014
8. “Digital Logic with Molecular Reactions”  
Hua Jiang, Marc Riedel and Keshab Parhi  
*IEEE/ACM International Conference on Computer-Aided Design*, pp. 721–727, 2013
9. “Stochastic Functions Using Sequential Logic”  
Naman Saraf, Kia Bazargan, David Lilja and Marc Riedel  
*IEEE International Conference on Computer Design*, pp. 507–510, 2013
10. “An Efficient Implementation of Numerical Integration Using Logical Computation on Stochastic Bit Streams”  
Weikang Qian, Chen Wang, Peng Li, David Lilja, Kia Bazargan, and Marc Riedel,  
*IEEE/ACM International Conference on Computer-Aided Design*, pp. 156–162, 2012
11. “The Synthesis of Complex Arithmetic Computation on Stochastic Bit Streams Using Sequential Logic”  
Peng Li, David Lilja, Weikang Qian, Kia Bazaragan and Marc Riedel  
*IEEE/ACM International Conference on Computer-Aided Design*, pp. 480–487, 2012
12. “The Synthesis of Linear Finite State Machine-based Stochastic Computational Elements”  
Peng Li, Weikang Qian, Marc Riedel, Kia Bazargan, David Lilja  
*IEEE/ACM Asia and South Pacific Design Automation Conference*, pp. 757–762, 2012

13. “Robust Tunable in vitro Transcriptional Oscillator Networks”  
Vishwesh Kulkarni, Theerachai Chanyaswad, Marc Riedel and Jongmin Kim  
*Asilomar Conference on Signals, Systems, and Computers*, pp. 114–119, 2012
14. “Asynchronous Computation with Molecular Reactions”  
Hua Jiang, Marc Riedel, and Keshab Parhi  
*Asilomar Conference on Signals, Systems, and Computers*, pp. 493–497, 2011
15. “Synchronous Sequential Computation with Molecular Reactions”  
Hua Jiang, Marc Riedel, and Keshab Parhi  
*ACM/IEEE Design Automation Conference*, pp. 836–841, 2011
16. “Rate-Independent Constructs for Chemical Computation”  
Philip Senum and Marc Riedel  
*Pacific Symposium on Biocomputing*, pp. 326–337, 2011
17. “Binary Counting with Chemical Reactions”  
Aleksandra Kharam, Hua Jiang, Marc Riedel, and Keshab Parhi  
*Pacific Symposium on Biocomputing*, pp. 302–313, 2011
18. “Networks of Passive Oscillators”  
Vishwesh Kulkarni, Marc Riedel, and Guy-Bart Stan  
*Allerton Conference on Communication, Control, and Computing*, 559–565, 2011
19. “A Synthesis Flow for Digital Signal Processing with Biomolecular Reactions”  
Hua Jiang, Aleksandra Kharam, Marc Riedel, and Keshab Parhi  
*IEEE/ACM International Conference on Computer-Aided Design*, pp. 417–424, 2010
20. “Lattice-Based Computation of Boolean Functions”  
Mustafa Altun and Marc Riedel  
*ACM/IEEE Design Automation Conference*, pp. 609–612, 2010
21. “Writing and Compiling Code into Biochemistry”  
Adam Shea, Brian Fett, Marc Riedel, and Keshab Parhi  
*Pacific Symposium on Biocomputing*, pp. 456–464, 2010
22. “The Synthesis of Combinational Logic to Generate Probabilities”  
Weikang Qian, Marc Riedel, Kia Bazargan, and David Lilja  
*IEEE/ACM International Conference on Computer-Aided Design*, pp. 367–374, 2009  
(Nominated for **IEEE/ACM William J. McCalla Best Paper Award**)
23. “Synthesizing Sequential Register-Based Computation with Biochemistry”  
Adam Shea, Brian Fett, Marc Riedel, and Keshab Parhi  
*IEEE/ACM International Conference on Computer-Aided Design*, pp 136–143, 2009
24. “Nanoscale Digital Computation Through Percolation”  
Mustafa Altun, Marc Riedel, and Claudia Neuhauser  
*ACM/IEEE Design Automation Conference*, pp. 615–616, 2009
25. “A Reconfigurable Stochastic Architecture for Reliable Computing”  
Xin Li, Weikang Qian, Marc Riedel, Kia Bazargan, and David Lilja  
*IEEE Great Lakes Symposium on VLSI Design*, pp. 315–320, 2009

26. “Estimation and Optimization of Reliability of Noisy Digital Circuits”  
Satish Sivaswamy, Kia Bazargan, and Marc Riedel  
*IEEE International Symposium on Quality Electronic Design*, pp 213–219, 2009
27. “Stochastic Transient Analysis of Biochemical Systems”  
Bin Cheng and Marc Riedel  
*Pacific Symposium on Biocomputing*, pp. 4–14, 2009
28. “Module Locking in Biochemical Synthesis”  
Brian Fett and Marc Riedel  
*IEEE/ACM International Conference on Computer-Aided Design*, 758–764, 2008
29. “The Analysis of Cyclic Circuits with Boolean Satisfiability”  
John Backes and Marc Riedel  
*IEEE/ACM International Conference on Computer-Aided Design*, pp. 143–148, 2008
30. “The Synthesis of Robust Polynomial Arithmetic with Stochastic Logic”  
Weikang Qian and Marc Riedel  
*ACM/IEEE Design Automation Conference*, pp. 648–653, 2008
31. “Synthesizing Stochasticity in Biochemical Systems”  
Brian Fett, Jehoshua Bruck, and Marc Riedel  
*ACM/IEEE Design Automation Conference*, 640–645, 2007
32. “The Synthesis of Cyclic Combinational Circuits”  
Marc Riedel and Jehoshua Bruck  
*ACM/IEEE Design Automation Conference*, pp. 163–168, 2003  
(Received the **DAC Best Paper Award**)

#### Peer-Reviewed Workshop Papers

1. “Using a Two-Dimensional Finite-State Machine for Stochastic Computation”  
Peng Li, Weikang Qian, David Lilja, Marc Riedel, and Kia Bazargan  
*IEEE/ACM International Workshop on Logic and Synthesis*, 8 pages, 2012
2. “Resolution Proofs as a Data Structure for Logic Synthesis”  
John Backes and Marc Riedel  
*IEEE/ACM International Workshop on Logic and Synthesis*, 8 pages, 2011
3. “Synthesizing Cubes to Satisfy a Given Intersection Pattern”  
Weikang Qian and Marc Riedel  
*IEEE/ACM International Workshop on Logic and Synthesis*, pp. 217–224, 2010
4. “Two-Level Logic Synthesis for Probabilistic Computation”  
Weikang Qian and Marc Riedel  
*IEEE/ACM International Workshop on Logic and Synthesis*, pp. 95–102, 2010
5. “Reduction of Interpolants for Logic Synthesis”  
John Backes and Marc Riedel  
*IEEE/ACM International Workshop on Logic and Synthesis*, 6 pages, 2010



6. “Digital Signal Processing with Biomolecular Reactions”  
Hua Jiang, Marc Riedel, and Keshab Parhi  
*IEEE Workshop on Signal Processing Systems*, pp. 237–242, 2010
7. “The Synthesis of Cyclic Dependencies with Craig Interpolation”  
John Backes and Marc Riedel  
*IEEE/ACM International Workshop on Logic and Synthesis*, pp. 24–30, 2009
8. “Synthesizing Sequential Register-Based Computation with Biochemistry”  
Adam Shea, Brian Fett, Marc Riedel, and Keshab Parhi  
*IEEE/ACM International Workshop on Logic and Synthesis*, 8 pages, 2009
9. “The Synthesis of Combinational Logic to Generate Probabilities”  
Weikang Qian, Marc Riedel, Kia Bazargan, and David Lilja  
*IEEE/ACM International Workshop on Logic and Synthesis*, 8 pages, 2009
10. “The Synthesis of Stochastic Logic to Perform Multivariate Polynomial Arithmetic”  
Weikang Qian and Marc Riedel  
*IEEE/ACM International Workshop on Logic and Synthesis*, pp. 79–86, 2008
11. “The Synthesis of Stochastic Circuits for Nanoscale Computation”  
Weikang Qian, John Backes, and Marc Riedel  
*IEEE/ACM International Workshop on Logic and Synthesis*, pp. 176–183, 2007
12. “Application of LUT Cascades to Numerical Function Generators”  
Tsutomu Sasao, Jon Butler, and Marc Riedel  
*Workshop on Synthesis & System Integration of Mixed Information*, 7 pages, 2004
13. “Timing Analysis of Cyclic Combinational Circuits”  
Marc Riedel and Jehoshua Bruck  
*IEEE/ACM International Workshop on Logic and Synthesis*, pp. 446–453, 2004
14. “Cyclic Combinational Circuits: Analysis for Synthesis”  
Marc Riedel and Jehoshua Bruck  
*IEEE/ACM International Workshop on Logic and Synthesis*, pp. 105–112, 2003

## Patents

1. “Method and Means for the Synthesis of Cyclic Combinational Circuits”  
Marc Riedel and Jehoshua Bruck  
U.S. Patent 7,249,341
2. “A Reliable Array of Distributed Computing Nodes”  
Vincent Bohossian, Charles Fan, Paul LeMahieu, Marc Riedel, Lihao Xu, and Jehoshua Bruck  
U.S. Patent 6,128,277

**Presentations with Published Abstracts**

1. “Polysynchronous Clocking for Molecular Computing”  
Marc Riedel (**invited**)  
*Workshop on Communications, Inference, and Computing in Molecular and Biological Systems*, Los Angeles, CA, 2015
2. “Synchronous Computation and Signal Processing and DNA”  
Marc Riedel (**invited**)  
*Workshop on Coding Techniques for Synthetic Biology*, Urbana-Champaign, IL, 2015
3. “Probability as State Variable for Nanoscale Computation”  
Marc Riedel (**invited**)  
*CMOS Emerging Technologies Workshop*, Vancouver, BC, 2015
4. “Pipelining for Accuracy with Stochastic Computing”  
Marc Riedel (**invited**)  
*Information Theory and Applications Workshop*, UC San Diego, 2015
5. “Probability as State Variable for Nanoscale Computation”  
Marc Riedel (**invited**)  
*Information Theory and Applications Workshop*, UC San Diego, 2014
6. “A Biomolecular Implementation of Non-Linear Systems”  
Vishwesh Kulkarni, Hua Jian, Theerachai Chanyaswad, Angelina Shudy, and Marc Riedel  
*International Workshop on Bio-Design Automation*, San Francisco, CA, 2012
7. “So Simple a Caveman Could Do It – Computing On Stochastic Bit Streams”  
Marc Riedel (**invited**)  
*Information Theory and Applications Workshop*, UC San Diego, 2012
8. “Synthesizing Logical Computation on Stochastic Bit Streams for Sensing Applications”  
Marc Riedel (**invited**)  
*IEEE CANDE Workshop*, San Jose, CA, 2011
9. “Digital Signal Processing with DNA”  
Hua Jiang, Marc Riedel, and Keshab Parhi  
*International Conference on DNA Computing*, Pasadena, CA, 2011
10. “Synthesizing Logical Computation on Stochastic Bit Streams”  
Marc Riedel (**invited**)  
*CMOS Emerging Technologies Workshop*, Whistler, BC, 2011
11. “Asynchronous Sequential Computation with Molecular Reactions”  
Hua Jiang, Marc Riedel, and Keshab Parhi  
*International Workshop on Bio-Design Automation*, San Diego, CA, 2011
12. “Biological Network Reconstruction Using Literature Curated and High Throughput Data”  
Vishwesh Kulkarni, Kalyanasundaram Subramanian, Reza Arastoo, Mayuresh Kothare, and Marc Riedel  
*International Workshop on Bio-Design Automation*, San Diego, CA, 2011

13. “Rate-Independent Constructs for DNA Computing”  
Philip Senum and Marc Riedel  
*Annual Institute of Biological Engineering Conference*, Atlanta, GA, 2011
14. “Lattice-Based Computation with Percolation”  
Mustafa Altun and Marc Riedel (**invited**)  
*IEEE/ACM International Symposium on Nanoscale Architectures*, Anaheim, CA, 2010
15. “Signal Processing Functions with Biomolecular Reactions”  
Hua Jiang, Marc Riedel, and Keshab Parhi  
*International Workshop on Bio-Design Automation*, Anaheim, CA, 2010
16. Session Summary: “Engineering Biology: Fundamentals and Applications”  
Marc Riedel, Soha Hassoun, and Ron Weiss (**invited**)  
*ACM/IEEE Design Automation Conference*, Anaheim, CA, 2010
17. “Digital Signal Processing with Biochemistry”  
Marc Riedel (**invited**)  
*Symposium on the Foundations of Nanoscience*, Salt Lake City, UT, 2010
18. “Iterative Computation with Biomolecular Reactions”  
Hua Jiang, Marc Riedel, and Keshab Parhi  
*Annual Institute of Biological Engineering Conference*, Boston, MA, 2010
19. “Stochastic Logic and Stochastic Biological Processes”  
Marc Riedel (**invited**)  
*Information Theory and Applications Workshop*, UC San Diego, 2010
20. “Computing with Things Small, Wet, and Random”  
Marc Riedel (**invited**)  
*IEEE CANDE Workshop*, Monterey, CA, 2009
21. “Stochastic Chemical Reaction Networks”  
Marc Riedel (**invited**)  
*International Workshop on Stochasticity*, Banff, Alberta, 2009
22. “Synthesizing Sequential Register-Based Computation with Biochemistry”  
Adam Shea, Brian Fett, Marc Riedel, and Keshab Parhi  
*International Workshop on Bio-Design Automation*, San Francisco, CA, 2009
23. “Synthesizing Circuit Constructs with Chemical Reaction Networks”  
Marc Riedel (**invited**)  
*Emergence in Chemical Systems Conference*, Anchorage, AK, 2009
24. “Rate-Independent Biochemical Synthesis”  
Adam Shea, Brian Fett, and Marc Riedel  
*Annual Institute of Biological Engineering Conference*, Santa Clara, CA, 2009
25. “Modular Stochastic Biochemistry”  
Brian Fett and Marc Riedel  
*Synthetic Biology 4.0*, Hong Kong, 2008

26. “Biochemical Pathways from Generic Designs”  
Brian Fett and Marc Riedel  
*Synthesis of Cells Meeting*, Kobe, Japan, 2008
27. “The Computer-Aided Synthesis of Stochastic Biochemistry”  
Brian Fett and Marc Riedel  
*Advances in Synthetic Biology Conference*, Cambridge, UK, 2008
28. “Synthesizing Stochasticity”  
Brian Fett and Marc Riedel  
*Synthetic Biology 3.0*, Zürich, Switzerland, 2007
29. “Using The Probability Gradient to Analyze Bifurcating Biochemical Systems”  
Brian Fett and Marc Riedel  
*International Conference on Systems Biology*, Yokohama, Japan, 2006
30. “Exact Stochastic Simulation with Event Leaping”  
Marc Riedel and Jehoshua Bruck  
*International Conference on Systems Biology*, Boston, MA, 2005

#### **Invited Talks, Colloquia, and Panels (without published abstracts)**

1. “Towards a Computer Engineering Discipline with DNA”  
*Biochemistry Seminar*  
Host: Prof. Aseem Ansari  
University of Wisconsin, Sept. 30, 2013
2. “The Modest Mathematician: Anecdotes from the Personal and Professional Life of Ivo Rosenberg”  
*Honorary Doctorate Ceremony for Ivo Rosenberg*  
Host: Prof. Dietlinde Lau  
University of Rostock, Germany, May 15, 2013
3. “Towards a Computer Engineering Discipline with DNA”  
*Computer Science Seminar*  
Host: Prof. Jack Lutz  
Iowa State University, Nov. 30, 2012
4. “Logic Synthesis for Networks of Four-Terminal Switches”  
*Computer Science Seminar*  
Host: Prof. Alex Sprintson  
Texas A&M University, April 20, 2012
5. “Random and Loopy Circuits: Complexity in Electronic and Biological Circuit Design”  
*Dept. of Defense Research and Engineering Complex Systems Study*  
Host: Robert Bond  
Squam Lake, NH, July 27, 2010
6. Panelist: “CAD for Nanoelectronic Circuits and Architectures – Are We There Yet?”  
*IEEE/ACM International Symposium on Nanoscale Architectures*  
Organizer: Prof. Garrett Rose  
Anaheim, CA, June 17, 2010

7. “Robust Stochastic Computation with Biomolecular Reactions”  
*NSF Workshop on Shared Organizing Principles in Biology*  
Organizer: Prof. Melanie Mitchel  
Arlington, VA, May 25, 2010
8. “Computing with Things Small, Wet, and Random”  
*Biological and Medical Physics Seminar Series*  
Host: Prof. Vincent Noireaux  
University of Minnesota, March 30, 2010
9. “Computing with Things Small, Wet, and Random”  
*Computer Science Seminar*  
Host: Prof. Soha Hassoun  
Tufts University, March 1, 2010
10. Tutorial: “Programming Constructs for Chemical Reaction Networks”  
*Pacific Symposium on Biocomputing*  
Organizer: Dr. Gil Alterovitz  
Kona, Hawaii, Jan. 7, 2010
11. “Computing with Things Small, Wet, and Random”  
*Electrical and Computer Engineering Seminar*  
Host: Prof. Azadeh Davoodi  
University of Wisconsin, Feb. 27, 2009
12. “Computing with Things Small, Wet, and Random”  
*Electrical and Computer Engineering Seminar*  
Host: Prof. Lin Zhong  
Rice University, Feb. 17, 2009
13. “Computing with Things Small, Wet, and Random”  
*Electrical and Computer Engineering Seminar*  
Host: Prof. Anxiao (Andrew) Jiang  
Texas A&M University, Feb. 17, 2009
14. “Synthesizing Nearly Rate Independent Biochemical Computation”  
*NSF Expeditions in Computing – Molecular Programming Workshop*  
Organizer: Prof. Erik Winfree  
Oxnard, CA, Jan. 10, 2009
15. “Computing with Things Small, Wet, and Random”  
*Electrical and Computer Engineering Seminar*  
Host: Prof. Rick Kiehl  
UC Davis, Sep. 29, 2008
16. “Synthesizing Stochastic Logic”  
*SRC Center on Functional Engineered Nano-Architectonics (FENA) Annual Meeting*  
Organizer: Prof. Kang Wang  
La Jolla, CA, June 13, 2008

17. Tutorial: “Synthesizing Stochastic Biochemical Reactions”  
*Tech Tune Up*  
Organizer: Prof. Ahmed Tewfik  
University of Minnesota, May 26, 2008
18. “Synthesizing Stochasticity in Circuits and in Biology”  
*DARPA MTO LIBRA Workshop*  
Organizer: Dr. John Damoulakis  
Arlington, VA, Nov. 29, 2007
19. Public Lecture: “Circuit Engineers Doing Biology –  
A Discourse on the Changing Landscape of Scientific Research”  
*Café Scientifique Public Seminar Series, Bell Museum of Natural History*  
Organizer: Peggy Korsmo-Kennon  
Bryant-Lake Bowl, Minneapolis, MN, Nov. 20, 2007
20. “High-Performance Computing for the Analysis and Synthesis of Biochemistry”  
*IBM Company Seminar*  
Host: Tim Mullins  
Rochester, MN, Oct. 8, 2007
21. Guest Lecture: “Molecular Computing”  
*IST 4, Information and Logic*  
Instructor: Prof. Jehoshua Bruck  
California Institute of Technology, May 25, 2007
22. “Analysis and Synthesis of Biochemical Reactions”  
*Cadence Research Labs Seminar*  
Host: Dr. Andreas Kuelmann  
Berkeley, CA, May 24, 2007
23. Tutorial: “Analysis and Synthesis of Stochastic Biochemical Reactions”  
*Tech Tune Up*  
Organizer: Prof. Kia Bazargan  
University of Minnesota, May 23, 2007
24. “Analysis and Synthesis of Stochastic Logic for Nanoscale Computation”  
*SRC Center on Functional Engineered Nano-Architectonics (FENA) Workshop*  
Organizer: Prof. Kang Wang  
UCLA, April 19, 2007
25. “Synthesizing Stochasticity in Biochemical Reaction Networks”  
*Mathematical Biology Seminar*  
Host: Prof. Hans Othmer  
University of Minnesota, March 21, 2007
26. “Exact Stochastic Simulation with Event Leaping”  
*Mathematical Biology Seminar*  
Host: Prof. Hans Othmer  
University of Minnesota, Nov. 2, 2006

27. “Cycles – The Good and the Bad in Logic Synthesis and Computational Biology”  
*Medtronic Technology Quarterly Seminar*  
 Host: Sara Audet  
 Fridely, MN, Oct. 5, 2006
28. “Cycles – The Good and the Bad in Logic Synthesis and Computational Biology”  
*Electrical Engineering Seminar*  
 Host: Prof. Mustafa Kamash  
 UC Santa Barbara, May 17, 2006
29. Job Talks: “Cyclic Combinational Circuits and Other Novel Constructs”
- *Electrical and Computer Engineering Dept.*  
University of Minnesota
  - *Electrical and Computer Engineering Dept.*  
University of Utah
  - *Electrical Engineering and Computer Science Dept.*  
Case Western Reserve University
  - *Electrical and Computer Engineering Dept.*  
University of Connecticut
  - *Electrical and Computer Engineering Dept.*  
University of Rochester
  - *Electrical and Computer Engineering Dept.*  
University of British Columbia
  - *Electrical Engineering and Computer Science Dept.*  
Washington State University
  - *Electrical and Computer Engineering Dept.*  
Arizona State University
  - *Electrical and Computer Engineering Dept.*  
University of Waterloo
  - *Electrical and Computer Engineering Dept.*  
Purdue University
  - *Electrical Engineering Dept.*  
University of Montreal École Polytechnique
- February–March, 2005  
**(11 interviews, 11 offers)**

## TEACHING at the UNIVERSITY of MINNESOTA

### Lecture-Based Courses

- EE 1301, “Introduction to Computing Systems”  
Fall 2009, Spring 2010, Fall 2010, Fall 2011, Fall 2012, and Fall 2013
- EE 2301, “Introduction to Digital System Design”  
Spring 2007, Spring 2008, and Spring 2009

- EE 2361, “Introduction to Microcontrollers”  
Fall 2015
- EE 5393, “Circuits, Computation, and Biology ”  
Spring 2008, Fall 2008, Spring 2011, Spring 2012, Spring 2013, Spring 2014, and Spring 2015
- EE 5583, “Error Control Coding”  
Fall 2012
- EE 5950, “Special Topics in Electrical and Computer Engineering”  
Fall 2006

### Labs and Discussion Sections

- EE 2002 “Introductory Circuits and Electronics Laboratory”  
Fall 2014
- EE 2301, “Introduction to Digital System Design”  
Fall 2006, Fall 2007, Fall 2008, Fall 2009, Fall 2010, Spring 2012, Spring 2013, Fall 2014
- EE 2361, “Introduction to Microcontrollers”  
Fall 2011

### Project-Based Courses

- EE 4951, “Senior Design”  
Spring 2008, Spring 2009, Fall 2011, Fall 2012, Fall 2013, Fall 2014, Fall 2015
- IT 1311, “Freshman Design”  
Fall 2006

## ADVISING and MENTORING

### Visiting Scholars Hosted

- Vishwesh Kulkarni (2011–2013)  
Funded through NSF CAREER Award.

### Doctoral Students

- Seunghyun Lim (2014– )  
Dissertation title: “DNA Implementation of Circuit and Programming Constructs”
- Ahmad Salehi (2012– )  
Jointly advised with Keshab Parhi  
Dissertation title: “Advanced Digital Signal Processing with Molecular Reactions”
- John Backes (2009–2013)  
Received a University of Minnesota **Doctoral Dissertation Award**, 2012–2013.  
Dissertation title: “SAT-Based Techniques for Logic Synthesis”
- Hua Jiang (2009–2012)  
(jointly advised with Keshab Parhi)  
Dissertation title: “Digital Logic and Digital Signal Processing with Molecular Reactions”  
Has accepted a position at Synposys, 2012.



- Mustafa Altun (2008–2012)  
Dissertation title: “Logic Synthesis for Networks of Four-Terminal Switches”  
Has accepted a tenure-track faculty position at the Istanbul Technical University, 2012.
- Weikang Qian (2006–2011)  
Dissertation title: “Synthesizing Logical Computation on Stochastic Bit Streams”  
Received a University of Minnesota **Doctoral Dissertation Award**, 2010–2011.  
Has accepted a tenure-track faculty position at the University of Michigan – Shanghai Jiao Tong University Joint Institute (SJTU), 2011.

### Master’s Students

- Vahbai Desai (2014–2016)  
Thesis title: “Dynamic Storage through Perpetual Packet Traffic”
- Brian Fett (2006–2008)  
Thesis title: “Synthesizing Stochasticity with Biochemical Reactions”
- Bin Cheng (2007–2008)  
Thesis title: “Stochastic Transient Analysis of Biochemical Systems”

### Undergraduate Students

- NSF Research Experiences for Undergraduates (REUs): Lawrence Hessburg (2015–2016), and Michelle Klecker (2015–2016)
- Directed Undergraduate Research Opportunities Program (UROP) projects for: John Backes (2008), Adam Shea (2008), Phil Greenberg (2009), Dan Hudrlik (2009), Kathleen Thurmes (2009), Aleksandra Kharam (2010), Joshua Krist (2010), Phillip Senum (2010), Jing Xiong (2010), Nick Gunderson (2011), Tor Anderson (2012), Grant Elbert (2012, 2013), Joe Connelley (2013), Caleb Sykes (2014), Blake Anderson (2014), Andrew Decker (2014), Megha Parhi (2015), Alex Keddy (2015), Ryan Mathison (2015), and McKenzie vanDerhagen (2015)
- Directed Senior Honors projects for: Jason Heebl (2006–2007), Tim Pankratz (2006–2007), John Kablan (2008–2009), John Backes (2008–2009), Phil Greenberg (2010–2011), Caitlin Race (2010–2011), Theerachai Chanyaswad (2011–2012), Phillip Senum (2012–2013), Thomas Daede (2013–2014), Megha Parhi (2014–2015), Andrew Erickson (2015–2016), and Devon Jensen (2015–2016)

### Degree Committees

- Ph.D. Final Committee for:  
Mustafa Altun (EE), Baktash Boghrati (EE), Denis Foo Kune (CS), Shuo Guo (EE), Sakeet Gupta (EE), Jianxin Fang (EE), Hua Jiang (EE), Hyoung Kim (EE), Robert Knuesel (EE), Sanjay Kumar (EE), Qunzeng Liu (EE), Pongstorn Maidee (EE), Andrew Ness (EE), Weikang Qian (EE), Hung Pham (CS), Satish Sivaswamy (EE), Jing Wang (EE), Yao Wang (EE), Xiaofei Wang (EE), Chuan Zhang (EE), Ningyuan Wang (Psychology), Bo Yuan (EE), Yingjie Lao (EE) and Chi Xu (EE)

- Ph.D. Preliminary Committee for:  
Mustafa Altun (EE), John Backes (EE), Baktash Boghrati (EE), Jianxin Fang (EE), Chenjie Gu (EE), Shuo Guo (EE), Sakeet Gupta (EE), Hyoung Kim (EE), Robert Knuesel (EE), Denis Foo Kune (CS), Sanjay Kumar (EE), Peng Li (EE), Qunzeng Liu (EE), Pongstorn Maidee (EE), Huang Pham (CS), Weikang Qian (EE), Naman Saraf (EE), Jonghyeon Shin (Physics), Satish Sivaswamy (EE), Bennett Swiniarski (CEMS), Jing Wang (EE), Chi Xu (EE), En Yuan (EE), Bo Yuan (EE), Yingie Lao (EE), and Zhiheng Wang (EE)
- M.S. Committee for:  
Amit Bose (CS), David Butcher (EE), Bin Chen (EE), Wuyang Dai (EE), Brian Fett (EE), Brandon Hoffman (CS), Praveen Kambam (CS), Manas Mignas (CS), Andrew Ness (EE), Bennett Swiniarski (CEMS), and Nimish Agashiwala (CS)

## PROFESSIONAL SERVICE

### Journal Paper Refereeing

- Served as referee for numerous journals, including: *Public Library of Science ONE*, *ACS Synthetic Biology*, *Science*, *Nature*, *Proceedings of the National Academy of Sciences*, *IEEE Transactions on Computers*, *IEEE Trans. on Computer-Aided Design of Circuits and Systems*, *IEEE Transactions on Information Theory*, *ACM Transactions on Design Automation of Electronic Systems*, *ACM Journal on Emerging Technologies*, *Bioinformatics*, *Journal of Chemical Physics*, and *SIAM Journal on Scientific Computing*

### Editorships

- Guest Associate Editor  
*IEEE Transactions on Emerging Topics in Computing*  
Special Issue on Approximate and Stochastic Computing, 2016

### Conference and Workshop Technical Program Committees

- ACM International Conference on Nanoscale Computing and Communication (2016)
- ACM/IEEE Design Automation Conference (2012, 2014)
- ACM/IEEE International Workshop on Bio-Design Automation (2009–2014)
- IEEE Great Lakes Symposium on VLSI (2009–2010)
- IEEE International Workshop on Genomic Signal Processing and Statistics (2009)
- IEEE/ACM International Conference on Computer-Aided Design (2008)
- IEEE/ACM International Workshop on Logic and Synthesis (2006– )

### Review Panels

- Served on review panel for
  - National Science Foundation’s Biocomputation Panel (2014, 2015)
  - National Science Foundation’s Software and Hardware Foundations Cluster CAREER Award (2009 and 2010)

## Workshop Organization

- DAC International Workshop on Bio-Design Automation (IWBD A)
  - Initiated Workshop in 2009
  - Steering Committee Chair (2009– )
  - General Chair (2010)
  - Technical Program Chair (2009)

Workshop attendance: **100 people** 2009, **85 people** in 2010, and **120 people** in 2011, more than 100 annually since.

- IEEE/ACM International Workshop on Logic and Synthesis (IWLS)
  - Program Chair (2009)
  - General Chair (2008)
  - Publications Chair (2007)
  - Panel Chair (2006)
- IEEE International Workshop on Genomic Signal Processing and Statistics
  - Finance Chair (2009)

## Professional Interest Groups

- ACM Special Interest Group on Design Automation (SIGDA)
  - Associate Editor of SIGDA Newsletter (2006– )
  - Co-chair of Technical Committee on Logic/RTL Design (2006–2009)
  - Vice-Chair of CAD-athlon Programming Competition (2006–2007)

## SERVICE to the UNIVERSITY of MINNESOTA

### Electrical and Computer Engineering Department

- Chair of Scholastic Standards & Awards (2014– )
- Member of Student Services and Advising Committee (2011–2014)
- Member of Graduate Committee (2006–2011)

### Biomedical Informatics and Computational Biology Program

- Member of Admissions Committee (2008–2009)

### University-Wide

- Faculty Senator (2013 – 2016)
- Interdisciplinary Informatics Seed Grant Program Review Panel (2009)