

# Yi SUN

## CONTACT INFORMATION

Department of Mathematics  
University of South Carolina  
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## EDUCATION

09/2002 - 11/2006 Ph.D. in Applied & Computational Mathematics, Princeton University  
Advisor: Prof. Björn Engquist  
09/1995 - 07/2002 B.S. (1999) & M.S. (2002) in Computational Math, Peking University

## EMPLOYMENT

08/2015 - present Associate Professor of Mathematics, University of South Carolina  
08/2011 - 08/2015 Assistant Professor of Mathematics, University of South Carolina  
08/2009 - 08/2011 NSF Math Institutes Postdoc, SAMSI, North Carolina  
07/2006 - 07/2009 Research Scientist, Courant Institute, New York University

## RESEARCH INTERESTS

Multiscale analysis, modeling and simulation in solids, fluid mechanics, chemistry and biology.  
Mathematical modeling and computation of biomaterials, complex biofluids, and cellular dynamics.  
Mathematical and computational neuroscience: dynamical system and chaos in neuronal networks.  
Network dynamics and flows: modeling, analysis and simulation for blood flow, traffic flow.  
Numerical methods for partial differential equations and interface tracking.  
Numerical optimization and inverse problems in mathematical physics.

## RESEARCH GRANTS

09/2013 - 08/2016 **PI**, NSF DMS-1318866, *Multiscale computational methods with applications in materials science and tissue engineering*, \$158,038.  
10/2012 - 06/2015 **Co-PI**, SC EPSCoR/IDeA GEAR Fund, Three successive grants, Total \$177,000.  
**Year 1:** *In-silico analysis of multicellular aggregate fusion using field and agent-based models.* **Year 2:** *Experimentally guided in-silico analysis of cellular aggregate fusion in bioprinting.* **Year 3:** *A 3D hybrid discrete-continuum model for cellular aggregate fusion.*

## HONORS AND AWARDS

01/2013 - 05/2013 Early Career Award, Mathematical Biosciences Institute (MBI), OSU.  
09/2009 - 08/2011 NSF Joint Math Institutes' Postdoctoral Fellowship, NSF/SAMSI.  
06/2009 Travel award for US Junior Oberwolfach Fellows, NSF DMS-0540019.  
07/2007 Travel award for *ICIAM07*, NSF DMS-0600108/SIAM.  
09/2005 - 12/2005 Long term fellowship in the program *Bridging Time and Length Scales in Materials Science and Bio-Physics*, IPAM, UCLA.  
06/2005 - 09/2005 Long term fellowship in the program *Summer Student Workshop*, T-7 Group, Los Alamos National Laboratory.  
05/2004 Travel award for *The 10th International Conference on Numerical Combustion*, AFOSR/DOE/SIAM.

- 09/2002 - 06/2003 Graduate Fellowship in Science and Engineering, Princeton University.  
 09/2000 - 06/2001 IET Fellowship and Academic Excellence Honor, Peking University.

## PUBLICATIONS

Articles in Computational Biology, Biomaterials, Tissue Engineering, Traffic Flow

1. Yi Sun and Ilya Timofeyev,  
*Kinetic Monte Carlo simulations of 1D and 2D traffic flows: Comparison of two look-ahead rules,*  
**Physical Review E**, 89 (2014), pp. 052810.
2. Cory Hauck, Yi Sun and Ilya Timofeyev,  
*On cellular automata models of traffic flow with look-ahead potential,*  
**Stochastics and Dynamics**, 14 (2014), pp. 1350022.
3. Yi Sun, Xiaofeng Yang and Qi Wang,  
*In-silico analysis on biofabricating vascular networks using kinetic Monte Carlo simulations,*  
**Biofabrication**, 6 (2014), pp. 015008.
4. Yi Sun and Qi Wang,  
*Modeling and simulations of multicellular aggregate self-assembly in biofabrication using kinetic Monte Carlo methods,*  
**Soft Matter**, 9 (2013), pp. 2172–2186.
5. Xiaofeng Yang, Yi Sun and Qi Wang,  
*A phase field approach for multicellular aggregate fusion in biofabrication,*  
**Journal of Biomechanical Engineering**, 135 (2013), pp. 071005.

Articles in Multiscale Modeling and Simulation, Numerical PDE

6. Pierre Gremaud and Yi Sun,  
*Numerical study of singularity formation in relativistic Euler flows,*  
**Communications in Computational Physics**, 16 (2014), pp. 348–364.
7. Yi Sun, Russel Caflisch and Björn Engquist,  
*A multiscale method for epitaxial growth,*  
**SIAM Multiscale Modeling & Simulation**, 9 (2011), pp. 335–354.
8. Weinan E, Björn Engquist and Yi Sun,  
*Heterogeneous multiscale methods with application to combustion,*  
in **Turbulent Combustion Modeling** (T. Echekeki and E. Mastorakos eds.), Springer, (2011),  
pp. 439–458.
9. Yi Sun and Björn Engquist,  
*Heterogeneous multiscale methods for interface tracking of combustion fronts,*  
**SIAM Multiscale Modeling & Simulation**, 5 (2006), pp. 532–563.
10. James M. Hyman, Shengtai Li and Yi Sun,  
*A hybrid multiscale method for coupling discrete and continuum models,*  
**LANL Technical Report** (2005), LA-UR-05-8248.
11. Pingwen Zhang, Yi Sun, Haiyan Jiang and Wei Yao,  
*Multiscale methods for inverse modeling in 1-D MOS capacitor,*  
**Journal of Computational Mathematics**, 21 (2003), pp. 85–100.

Articles in Computational Neuroscience

12. Yi Sun, Aaditya V. Rangan, Douglas Zhou and David Cai,  
*Coarse-grained event tree analysis for quantifying Hodgkin-Huxley neuronal network dynamics,*  
**Journal of Computational Neuroscience**, 32 (2012), pp. 55–72.

13. Douglas Zhou, Yi Sun, Aaditya V. Rangan and David Cai, *Spectrum of Lyapunov exponents of non-smooth dynamical systems of integrate-and-fire type*, **Journal of Computational Neuroscience**, 28 (2010), pp. 229–245.
14. Yi Sun, Douglas Zhou, Aaditya V. Rangan and David Cai, *Pseudo-Lyapunov exponents and predictability of Hodgkin-Huxley neuronal network dynamics*, **Journal of Computational Neuroscience**, 28 (2010), pp. 247–266.
15. Douglas Zhou, Aaditya V. Rangan, Yi Sun and David Cai, *Network-induced chaos in integrate-and-fire neuronal ensembles*, **Physical Review E**, 80 (2009), pp. 031918.
16. Yi Sun, Douglas Zhou, Aaditya V. Rangan and David Cai, *Library-based numerical reduction of the Hodgkin-Huxley neuron for network simulations*, **Journal of Computational Neuroscience**, 27 (2009), pp. 369–390.

## PRESENTATIONS

### Conferences/Workshops

1. KI-Net Workshop: Collective Dynamics in Biological and Social Systems, Duke University, Durham, NC, November 2015.
2. AMS Fall Eastern Sectional Meeting, Rutgers University, New Brunswick, NJ, Nov. 2015.
3. KI-Net Conference: Numerical and Multiscale Issues for Partial and Integral Differential Equations, The University of Texas at Austin, TX, October 2015.
4. The 8th International Congress on Industrial and Applied Mathematics (ICIAM 2015), Beijing, China, August 2015.
5. Society for Mathematical Biology 2015 Annual Meeting, Atlanta, GA, July 2015.
6. HUST Workshop on Frontiers of Modern Applied Mathematics, Wuhan, China, June 2015.
7. SIAM Conference on Life Sciences, Charlotte, NC, August 2014.
8. International Conference on Modeling of Complex Biological Systems, Nankai University, Tianjin, China, May 2014.
9. The 38th Annual SIAM Southeastern Atlantic Section Conference (SIAM-SEAS 2014), Florida Institute of Technology, Melbourne, FL, March 2014.
10. SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, PA, June 2013.
11. The 8th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, University of Georgia, Athens, GA, March 2013.
12. SIAM Conference on Computational Science and Engineering, Boston, MA, February 2013.
13. The 9th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, FL, July 2012.
14. The 36th Annual SIAM Southeastern Atlantic Section Conference (SIAM-SEAS 2012), University of Alabama, Huntsville, AL, March, 2012.
15. The 7th International Congress on Industrial and Applied Mathematics (ICIAM 2011), Vancouver, Canada, July 2011.
16. SIAM Conference on Life Sciences, Pittsburgh, PA, July 2010.
17. MFO Workshop: Computational Multiscale Methods, Oberwolfach, Germany, June 2009.
18. SIAM Conference on Applications of Dynamical Systems, Snowbird, UT, May 2009.

19. SIAM Conference on Life Sciences, Montreal, Canada, August 2008.
20. Sloan-Swartz Centers for Theoretical Neurobiology Annual Summer Meeting 2008, Princeton University, Princeton, NJ, July 2008.
21. Bridging Time and Length Scales in Materials Science and Bio-Physics: IPAM Reunion Conference II, Lake Arrowhead, CA, June 2008.
22. Sloan-Swartz Centers for Theoretical Neurobiology Annual Summer Meeting 2007, University of California, San Diego, CA, July 2007.
23. BIRS Workshop: Numerical Analysis of Multiscale Computations, Banff, Canada, Jan. 2007.
24. The 3rd Annual PACM Conference, Princeton University, Princeton, NJ, May 2005.
25. SIAM Conference on Computational Science and Engineering, Orlando, FL, February 2005.
26. The 10th International Conference on Numerical Combustion, Sedona, AZ, May 2004.

#### Colloquia/Seminars

27. Applied Mathematics Seminar, ICMSEC, Chinese Academy of Sciences, China, May 2015.
28. Applied Math Seminar, School of Mathematical Sciences, Peking Univ., China, May 2015.
29. Applied Math Seminar, Mathematical Sciences Center, Tsinghua Univ., China, June 2014.
30. Applied Math Seminar, School of Mathematics, Shandong University, China, June 2014.
31. Applied Mathematics Colloquium, ICMSEC, Chinese Academy of Sciences, China, June 2014.
32. Applied/Computational Mathematics Seminar, Beijing International Center for Mathematical Research, China, June 2014.
33. Applied Mathematics Seminar, City University of Hong Kong, Hong Kong, May 2014.
34. Applied/Computational Mathematics Seminar, University of South Carolina, SC, Feb. 2014.
35. Applied Mathematics Seminar, Georgia State University, GA, February, 2014.
36. MBI Visitor Seminar, Mathematical Biosciences Institute, OH, April 2013.
37. Applied Mathematics Seminar, Ohio State University, OH, April 2013.
38. Applied Mathematics Seminar, Michigan State University, MI, October 2011.
39. Applied/Computational Mathematics Seminar, University of South Carolina, SC, Sep. 2011.
40. Mathematics Colloquium, University of South Carolina, SC, February 2011.
41. SAMSI Postdoc Seminar, Statistical & Applied Mathematical Sciences Inst., NC, Dec. 2010.
42. Numerical Analysis & Differential Equations Seminar, NC State University, NC, March 2010.
43. Applied Mathematics Seminar, ICMSEC, Chinese Academy of Sciences, China, July 2009.
44. Applied Mathematics Seminar, Peking University, China, July 2009.
45. Mathematical Biology Seminar, Courant Institute, New York University, NY, May 2009.
46. CNLS Seminar, Los Alamos National Laboratory, NM, March 2009.
47. Applied Mathematics Colloquium, University of Houston, TX, March 2009.
48. Mathematics Colloquium, University of Tennessee, TN, February 2009.
49. Applied Mathematics Seminar, Oak Ridge National Laboratory, TN, February 2009.
50. Mathematics Colloquium, Texas A&M University, TX, February 2009.

51. Applied Mathematics Colloquium, New Jersey Institute of Technology, NJ, January 2009.
52. Mathematics Colloquium, Rensselaer Polytechnic Institute, Troy, NY, November 2008.
53. Dynamical Systems & Nonlinear Science Seminar, Princeton University, NJ, November 2008.
54. Applied Mathematics Seminar, IPAM, University of California, Los Angeles, CA, Oct. 2005.
55. CNLS Seminar, Los Alamos National Laboratory, NM, July 2005.

#### Posters

56. IPAM Workshop: Mathematical Foundations of Traffic, University of California, Los Angeles, CA, September 2015.
57. ICERM Workshop: From the Clinic to Partial Differential Equations and Back: Emerging Challenges for Cardiovascular Mathematics, Brown University, Providence, RI, Jan. 2014.
58. External Advisory and Review Board Meeting on NSF/EPSCoR South Carolina Project for Organ Biofabrication, Columbia, SC, May 2013.
59. SAMSI Workshop: Stochastic Dynamics Transition, Research Triangle Park, NC, Nov. 2010.
60. IMA Workshop: Numerical Solutions of Partial Differential Equations: Novel Discretization Techniques, University of Minnesota, Minneapolis, MN, November 2010.
61. SAMSI Workshop: Complex Networks Modeling, Research Triangle Park, NC, October 2010.
62. John H. Barrett Memorial Lectures: Multi-Scale Modeling and Simulation in Materials Science, University of Tennessee, Knoxville, TN, April 2007.
63. CSCAMM Workshop: Nonequilibrium Interface and Surface Dynamics, University of Maryland, College Park, MD, April 2007.
64. IMA Workshop: Future Challenges in Multiscale Modeling and Simulation, University of Minnesota, Minneapolis, MN, November 2004.

#### TEACHING EXPERIENCE

	Department of Mathematics, University of South Carolina.
Fall/2015	MATH 526: <i>Numerical Linear Algebra</i> , MATH 242: <i>Elementary Differential Equations</i> ,
Spring/2015	MATH 520: <i>Ordinary Differential Equations</i> , MATH 242: <i>Elementary Differential Equations</i> ,
Fall/2014	MATH 524: <i>Nonlinear Optimization</i> ,
Spring/2014	MATH 241: <i>Vector Calculus</i> , MATH 709: <i>Foundations of Computational Mathematics II</i> ,
Fall/2013	MATH 708: <i>Foundations of Computational Mathematics I</i> ,
Fall/2012	MATH 141: <i>Calculus I (Honors)</i> , MATH 544: <i>Linear Algebra</i> ,
Spring/2012	MATH 242: <i>Elementary Differential Equations</i> , MATH 544: <i>Linear Algebra</i> ,
Fall/2011	MATH 242: <i>Elementary Differential Equations</i> ,
Spring/2010	MA 241: <i>Calculus II</i> , Department of Mathematics, NC State University.
Spring/2007	Guest Lecturer for two graduate courses, Courant Institute, NYU. 1. <i>Special Topics in Applied Mathematics: Crystal growth</i> . 2. <i>Advanced Topics in Math Physiology: Math Neurophysiology</i> .

## EDUCATION/OUTREACH EXPERIENCE

- 01/2015 Judge, South Carolina High School Math Contest, USC.
- 04/2014 Judge, Poster Competition at SC EPSCoR/IDeA State Conference, Columbia.
- 02/2014 Judge, South Carolina High School Math Contest, USC.
- 04/2012 Judge, The Annual Science Fair, High School Environmental Science, Mathematics and Related Technology (eSMART), Voorhees College.
- 01/2012 Judge, South Carolina High School Math Contest, USC.
- 05/2011 Lecturer, SAMSI Interdisciplinary Workshop for Undergraduates.
- 10/2010 Lecturer, SAMSI Undergraduate Workshop on Complex Networks.

## RESEARCH STUDENT ADVISEMENT

- Ph.D. Advisee:  
Michael Laughlin (USC/Math, expected 08/2017);
- Committee of Ph.D. Defense:  
Xiao Xiao (04/2012), Chen Chen (06/2012), Kanadpriya Basu (06/2012),  
Treena Basu (06/2012), Norazaliza Mohd Jamil (03/2015);
- Undergraduate Students:  
Tyler Wagner (USC/Computer Science & Math, 04/2014-present);

## SYNERGISTIC ACTIVITIES

- Faculty Advisor of Pi Mu Epsilon (PME) Math Club (2011-2013); High School Mathematics Contest Committee (2011-present); Graduate Curriculum Committee (Bio-mathematics) (2011-present); Faculty Hiring Committee (Bio-mathematics) (2011-2014); Applied and Computational Mathematics Committee (2011-present); USC Math Undergraduate Advisor (2011-present); Department Events Committee (2011-present); Chair of Qualifying Exam (2012-present); Undergraduate Advisory Council (2013-present); Calculus Textbook Committee (2014-2015);
- Referee for Professional Journals/Books:  
IEEE Trans. Information Theory, Mathematical Methods in the Applied Sciences, Mathematics and Computers in Simulation, Communications in Computational Physics, Molecular BioSystems, Soft Matter, Discrete and Continuous Dynamical System-B, Industrial & Engineering Chemistry Research, Differential Equations (Textbook, 3ed.)
- Conferences/Minisymposia Organizer:  
Minisymposium: *Modeling and Simulation of Complex Biological Systems*, SIAM Conference on Life Sciences, Charlotte, NC, August 2014.  
Minisymposium: *Modeling and Computation of Problems in Mathematical Biology*, The 38th Annual SIAM Southeastern Atlantic Section Conference (SIAM-SEAS 2014), Florida Institute of Technology, Melbourne, FL, March 2014.  
Minisymposium: *Computational Methods for Nano Scale Materials and Devices*, SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, PA, June 2013.
- Organizer, Applied and Computational Mathematics Seminar, USC (2012-2014).
- Math Community Service: NSF site visit meeting at SAMSI, Past postdocs/visitors session participant, April 2015.

## MEMBERSHIPS

American Mathematical Society, Society for Industrial and Applied Mathematics