

# Weiying Ren – Curriculum Vitae

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## ADDRESS

Courant Institute of Mathematical Sciences, 251 Mercer Street, New York University, New York, NY 10012

Telephone: 212 998 3174; Fax: 212 995 4121

E-mail: [weiying@cims.nyu.edu](mailto:weiying@cims.nyu.edu), [matrw@nus.edu.sg](mailto:matrw@nus.edu.sg)

Website: <http://www.cims.nyu.edu/~weiying>

## EDUCATION

- Ph.D. September, 2002, Courant Institute, New York University
- B.S. June, 1994, Department of Mathematics, Nanjing University, China

## ACADEMIC APPOINTMENTS

- 2011-present, Associate Professor of Mathematics, National University of Singapore and IHPC  
2005-present, Assistant Professor of Mathematics, Courant Institute, New York University  
2007-2011, Director of the Master Program in Scientific Computing, Courant Institute
- 2003-2005, Instructor, Department of Mathematics, Princeton University
- 2002-2003, Member, School of Mathematics, Institute for Advanced Study, Princeton

## AWARDS

Alfred P. Sloan Research Fellowship, 2007-2009

## TEACHING AT NUS AND COURANT INSTITUTE

- Undergraduate courses: Calculus I, II; Linear Algebra
- Graduate courses: Linear Algebra, Numerical Methods, Applied Functional Analysis, Atomistic Modeling and Computation, Methods of Applied Mathematics

## GRADUATE STUDENTS

Kellen Petersen (PhD student, Courant Institute)

John Wu (Master student, Courant Institute, 2011)

## PUBLICATIONS (CHRONOLOGICAL)

1. Contact Line Dynamics on Heterogeneous Surfaces  
Weiying Ren and W. E  
Phys. Fluids, **23**, 072103 (2011)
2. Derivation of Continuum Models for the Moving Contact Line Problem Based on Thermodynamic Principles  
Weiying Ren and W. E  
Commun. Math. Sci. **9**, 597 (2011)
3. Continuum Models for the Moving Contact Line Problem  
Weiying Ren, D. Hu and W. E  
Phys. Fluids, **22**, 102103 (2010)
4. Computing Transition Rates of Thermally Activated Events in Dislocation Dynamics  
C. Jin, W. Ren and Y. Xiang  
Scripta Materialia, **62**, 206 (2010)
5. Mimimum Action Method for the Kardar-Parisi-Zhang Equation  
H. C. Fogedby and Weiying Ren  
Phys. Rev. E, **80**, 041116 (2009)

6. A General Strategy for Designing Seamless Multiscale Methods  
W. E, Weiqing Ren and E. Vanden-Eijnden  
*J. Comput. Phys.* **228**, 5437 (2009)
7. Phase Slips in Superconducting Wires with Nonuniform Cross Section: A Numerical Evaluation Using the String Method  
C. Qiu, T. Qian and Weiqing Ren  
*Phys. Rev. B* **77**, 104516 (2008)
8. Application of the String Method to the Study of Critical Nuclei in Capillary Condensation  
C. Qiu, T. Qian and Weiqing Ren  
*J. Chem. Phys.* **129**, 154711 (2008)
9. Sequential Multiscale Modeling Using Sparse Representation  
C. Garcia-Cervera, Weiqing Ren, J. Lu and W. E  
*Commun. Comput. Phys.* **4**, 1025 (2008)
10. Adaptive Minimum Action Method for the Study of Rare events  
X. Zhou, Weiqing Ren and W. E  
*J. Chem. Phys.* **128**, 104111 (2008)
11. Seamless Multiscale Modeling of Complex Fluids Using Fiber Bundle Dynamics  
Weiqing Ren  
*Commun. Math. Sci.* **5**, (2007)
12. Analytical and Numerical Study of Coupled Atomistic-Continuum Methods for Fluids  
Weiqing Ren  
*J. Comput. Phys.* **227**, 1353 (2007)
13. Simplified and Improved String Method for Computing the Minimum Energy Paths in Barrier-Crossing Events  
W. E, Weiqing Ren and E. Vanden-Eijnden  
*J. Chem. Phys.* **126**, 164103 (2007)
14. Numerical Study of Metastability due to Tunneling: The Quantum String Method  
T. Qian, Weiqing Ren, J. Shi, W. E and P. Sheng  
*Physica A*, **379**, 491 (2007)
15. Boundary Conditions for the Moving Contact Line Problem  
Weiqing Ren and W. E  
*Physics of Fluids*, **19**, 022101 (2007)
16. Heterogeneous Multiscale Methods: A Review  
W. E, B. Engquist, X. Li, Weiqing Ren and E. Vanden-Eijnden  
*Commun. Comput. Phys.* **2**, 367 (2007)
17. Heterogeneous Multiscale Method for the Modeling of Complex Fluids and Micro Fluidics  
Weiqing Ren and W. E  
*J. Comput. Phys.* **204**, 1 (2005)
18. Finite-Temperature String Method for the Study of Rare Events  
W. E, Weiqing Ren and E. Vanden-Eijnden  
*J. Phys. Chem. B* **109**, 6688 (2005)
19. Transition Pathways in Complex Systems: Application of the Finite-Temperature String Method to the Alanine Dipeptide  
Weiqing Ren, E. Vanden-Eijnden, P. Maragakis, and W. E  
*J. Chem. Phys.* **123**, 134109 (2005)
20. Transition Pathways in Complex Systems: Reaction Coordinates, Isocommittor Surfaces, and Transition Tubes  
W. E, Weiqing Ren, and E. Vanden-Eijnden  
*Chem. Phys. Lett.* **413**, 242 (2005)
21. Current Dissipation in Thin Superconducting Wires: Accurate Numerical Evaluation Using the String Method  
T. Qian, Weiqing Ren, and P. Sheng  
*Phys. Rev. B*, **72**, 014512 (2005)
22. Minimal Action Method for the Study of Rare Events

- W. E, Weiqing Ren, and E. Vanden-Eijnden  
Comm. Pure Appl. Math. **57**, 637 (2004)
23. Stability of the Matrix Factorization for Solving Block Tri-diagonal Symmetric Indefinite Linear Systems  
J. Zhao, W. Wang, and Weiqing Ren  
Bit Numerical Mathematics **44**, 181 (2004)
  24. Energy Landscape and Thermally Activated Switching of Submicron-sized Ferromagnetic Elements  
W. E, Weiqing Ren, and E. Vanden-Eijnden  
J. Appl. Phys. **93**, 2275 (2003)
  25. Higher Order Numerical Scheme in the String Method for Finding Minimum Energy Paths and Saddle Points  
Weiqing Ren  
Commun. Math. Sci. **1**, 377 (2003)
  26. Numerical Simulation of Self-focusing of Ultrafast Laser Pulse  
G. Fibich, Weiqing Ren, and X. P. Wang  
Phys. Rev. E **67**, 056603 (2003)
  27. String Method for the Study of Rare Events  
W. E, Weiqing Ren, and E. Vanden-Eijnden  
Phys. Rev. B **66**, 052301 (2002)
  28. A New Adaptive Grid Method Based on Iterative Grid Redistribution  
Weiqing Ren and X. P. Wang  
Methods and Application of Analysis **8**, 515 (2001)
  29. An Iterative Grid Redistribution Method for Singular Problems in Multiple Dimensions  
Weiqing Ren and X.P.Wang  
J. Comput. Phys. **159**, 246 (2000)
  30. Iterative Methods with Pre-conditioners for Indefinite Systems  
Weiqing Ren and J. Zhao  
J. Comput. Math. **17**, 89 (1999)

#### **INVITED LECTURES IN RECENT YEARS**

1. INI/WIMCS Meeting on Computational Challenges in Partial Differential Equations, Swansea, UK, April 4-8, 2011
2. Workshop on Fluid Motion Driven by Immersed Structures, Fields Institute, Toronto, Canada, August 9-13, 2010
3. Workshop on Computational Problems in Material Sciences, Suzhou University, August 2-5, 2010
4. Mini-symposium on Phase Field Simulation of Interfacial Phenomena, SIAM Conference on Mathematical Aspects of Material Science, Philadelphia, May 23-26, 2010
5. Mini-symposium on Recent Advances in Modeling, Simulation and Analysis of Dislocations in Solids, SIAM Conference on Mathematical Aspects of Material Science, Philadelphia, May 23-26, 2010
6. Workshop on Interface Problems in Fluids and Materials, National Chiao Tung University, Taiwan, December 19-20, 2009
7. New York Conference on Applied Mathematics, Rochester Institute of Technology, October 17, 2009
8. IMA workshop on "Flowing complex fluids: Fluid mechanics –Interaction of Microstructure and Flow", October 12-16, 2009
9. The 14<sup>th</sup> National Symposium on Numerical Methods for Fluids, China, August 3-7, 2009
10. Annual conference of the EPSRC Network: Mathematical Challenges in Molecular Dynamics, University of Bath, July 13-15, 2009
11. Oberwolfach workshop on Computational Multiscale Methods, June 14-20, 2009
12. EPSRC workshop on Molecular Dynamics, Warwick, June 1-5, 2009
13. Mini-symposium on "Numerical methods for molecular dynamics and molecular modeling", International Conference on Scientific Computation and Differential Equations, Beijing, May 25-29, 2009
14. IMA workshop on "Molecular Simulations: Algorithms, Analysis, and Applications", May 18-22, 2009

15. Mini-symposium on “Theoretical and Computational Modeling of Complex Fluids/Soft Matter”, SIAM Conference on Computational Science and Engineering, March 2-6, 2009
  16. Mini-symposium on “Numerical Methods for Stochastic Computation and Uncertainty Quantification”, SIAM Conference on Computational Science and Engineering, March 2-6, 2009
  17. Workshop on “Rare events in High-Dimensional Systems”, IPAM, Feb. 23-27, 2009
  18. Mini-symposium on “Interactions between Continuum Physics and Molecular Dynamics”, the 9<sup>th</sup> SIMAI congress, Rome, Sep. 15-16, 2008
  19. International Symposium on Multiscale Simulations of Biological and Soft Materials, Tokyo, Japan, June 18-20, 2008
  20. Special session on “Mathematics of Multiscale Phenomena”, AMS sectional meeting, Courant Institute of New York University, Mar. 15-16, 2008
  21. Workshop on “Mathematics of Multi-Scale Problems”, Institute for Advanced Studies, the Hong Kong University of Science and Technology, Dec. 9-13, 2007
  22. Workshop on “The Practice and Theory of Stochastic Simulation”, American Institute of Mathematics, Oct 22-26, 2007
  23. Mini-symposium on “Multiscale Modeling and Computation”, ICIAM, Zurich, Switzerland, July 16-20, 2007
  24. Workshop on “Multiscale Modeling and Simulation of Complex Fluids”, Center for Scientific Computation and Mathematical Modeling, University of Maryland, April 13-19, 2007
  25. Symposium on “Application of Interface methods in Multi-Physics Problems”, SIAM Conference on Computational Science & Engineering, Feb 19 – Feb 23, 2007
  26. Workshop on “Numerical Analysis of Multiscale Computations”, Banff International Research Station, Jan 28 – Feb 2, 2007
  27. Workshop on “Computational Science” at PACM, Princeton University, October 14-15, 2006
  28. Workshop on “Multiscale Modeling of Complex Fluids”, Peking University, June 16-17, 2006
  29. International Conference on Applied Mathematics and Interdisciplinary Research-Nankai, Nankai University, Tianjin, China, June 12-15, 2006
  30. Conference on “Frontiers in Applied and Computational Mathematics”, New Jersey Institute of Technology, May 15-16, 2006
  31. IMA Workshop on “Multiscale Analysis and Computation”, Institute for Pure and Applied Mathematics (IPAM), UCLA, November 14-16, 2005
  32. Workshop on “Effective Theories for Materials and Macromolecules”, Institute for Mathematics and its Applications (IMA), University of Minnesota, June 8-11, 2005
- **Summer schools**

Lecturing a course on Atomistic Modeling and Computations in the summer school “Applied mathematics and scientific computation”, Peking University, China, 2004, 2006, 2007, 2009, 2010

Lecturing molecular dynamics in the summer school on Applied Sciences at Shanghai Jiaotong University, China, July, 2009

Lecturing in the summer school “Applied Mathematics Related to Stochastic Analysis and Statistical Physics”, Fudan University, China, June 30-July 25, 2008
  - **Research seminars**
    1. “The String Method for Computing Transition Pathways in Complex Systems”, Probability seminar, Division of Applied Mathematics, Brown University, April 6, 2010
    2. “The Moving Contact Line Problem and the Spreading of Liquid Thin Films”, Applied Mathematics Colloquium, New Jersey’s Science & Technology University, February 19, 2010
    3. “The Moving Contact Line Problem and the Spreading of Liquid Thin Films”, Mathematics Colloquium, National University of Singapore, January 6, 2010
    4. “Multiscale Modeling and Simulation”, PDE and Numerical Analysis seminar, University of Maryland at College Park, November 16, 2009

5. "Transition Pathways in Complex Systems", Mini-symposium at the Physics department of Kyoto University, Japan, June 16, 2008
6. "Coupled Atomistic-Continuum Methods for Fluids", Applied and Computational Mathematics Seminar, University of North Carolina at Charlotte, April 16, 2008
7. "Transition Pathways in Complex Systems", Mathematics Colloquium, University of Central Florida, March 27, 2008
8. "Coupled Atomistic-Continuum Methods for Fluids", Computational and Applied Mathematics Seminar, Purdue University, Nov 30, 2007
9. "Coupled Atomistic-Continuum Methods for Fluids", AMS Computational Math Seminar, State University of New York, Stony Brook, Oct 31, 2007
10. "Analytical and Numerical Study of Coupled Atomistic-Continuum Methods for Fluids", Applied Mathematics Seminar, Temple University, April 25, 2007
11. "Analytical and Numerical Study of Coupled Atomistic-Continuum Methods for Fluids", Applied Math Seminar, Courant Institute, April 20, 2007
12. "The Moving Contact Line Problem", Applied Mathematics Colloquium, New Jersey Institute of Technology, Nov 17, 2006
13. "Transition Pathways in Complex Systems", Department of Mathematics, Nanjing University, China, June 9, 2006
14. "The Moving Contact Line Problem", Applied Mathematics Seminar, Courant Institute, New York University, March 31, 2006
15. "Transition Pathways in Complex Systems", Computational and Applied Mathematics Colloquium, Penn State University, Jan 20, 2006