

# Curriculum Vitae

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# 1 Personal Information

## 1.1 Employment

ILLINOIS INSTITUTE OF TECHNOLOGY

**Professor**, Dept. of Applied Mathematics, Aug. 2020 - present.

**Associate Professor**, Dept. of Applied Mathematics, Aug. 2014 - 2020.

**Assistant Professor**, Dept. of Applied Mathematics, Aug. 2008 - July 2014.

UNIVERSITY OF CALIFORNIA, IRVINE

**Visiting Assistant Professor**, Dept. of Mathematics, Sept. 2005 - June 2008.

## 1.2 Education

UNIVERSITY OF MINNESOTA, TWIN CITIES

**Ph.D.** in Mechanics and Applied Math, June 2005

Thesis Advisors: Perry Leo and John Lowengrub

## 1.3 Other Academic Experience

**Visiting Scientist**, Liquid Crystal Institute, Kent State University, January 2005-March 2005, and August 2005. Host: Prof. Peter Palffy-Muhoray. Conducted and reported experiments of Hele-Shaw flow with a variable injection flux; verified the theory of interface morphology control.

**Long-Term Visiting Student**, Institute for Mathematics and its Application (IMA), University of Minnesota, June 2001-June 2003. Participated in workshops and research seminars.

# 2 Research and Teaching

## 2.1 Research Interests

- **Deterministic and Stochastic Modeling/Computation of moving/free boundary problems**
- **Numerical Analysis:** boundary integral/element method; finite element/difference method; sharp interface tracking and phase field interface capturing methods.
- **Computational Fluid Dynamics:** Hele-Shaw flows (flow in porous media); Stokes flow; viscoelastic fluids.

- **Computational Materials Science:** microstructural evolution in fluids and elastic media; phase decompositions/transformations in solids and liquids; crystal growth; growth of heteroepitaxial thin films; coarsening problems.
- **Mathematical Biology:** Phase separation and deformation of bilayer lipid membranes; tumor modeling and simulations.

## 2.2 Grants and Proposals

**Proposals funded** (total fund amount:  $\sim$  2.0 million; Shuwang share:  $\sim$ 1.0 million.)

- **NSF-ECCS** “*Coupled Analytical Field Approach for Optimal Design and Accurate Modeling of Electric Machines*”, with M. Krishnamurthy, Co-PI, \$396,729. 2019-2022.
- **NSF-DMS** “*Modeling and Computation of Three-dimensional Multicomponent and Multicompartement Vesicles in Complex flow Domains*”, PI, \$274,990, 2017-2020.
- **NSF-ECCS** “*Computationally Efficient Solvers for Power System Simulation*”, Co-PI, \$399,980. 2013-2017. One year no-cost extension.
- **NSF-DMS** “*Reactive instabilities, colloids, and interfacial flows: experiments, modeling and numerics*”, PI, \$400,000, 2012-2015.
- **NSF-DMS** “*Computational and theoretical approaches for the morphological control of material microstructures*”, PI, \$411,934. 2009-2013.
- **NSF-DMS** “*Scientific Computing Research Environments for the Mathematical Sciences (SCREMS) at IIT*”, Co-PI, \$97,900. 2009-2010.
- **IIT ERIF** “*Real-time Electromagnetic Modeling and Analysis Technique for Electric Machines*”, by Educational and Research Initiative Fund of IIT, Co-PI, \$25,000, 2010.
- **Summer undergraduate student research award** from College of Science, IIT. \$5K for Caleb Hamilton doing summer research, 2014.
- **Summer undergraduate student research award** from College of Science, IIT. \$5K for summer research, 2010.

## 2.3 Awards and Honors

- **Inaugural John Rowe University Excellence in Teaching Awards**, IIT, April 2014.

- **Dean's Excellence Awards for Teaching**, College of Science, IIT, 2013.
- **Dean's Excellence Awards for Research**, College of Science, IIT, 2009.
- **NSF Fellowship** Summer Institute on Nanomechanics and Nanomaterials and Micro/Nano manufacturing, Northwestern University, Chicago, May 2009.
- **Professor of the Quarter Fall 2006 for Excellence in Teaching** (student elected), Gamma Phi Beta, University of California, Irvine, 2007.
- **Doctorate Dissertation Fellowship**, Graduate School, University of Minnesota, 2004-2005.

## 2.4 Publications

For each of the peer-reviewed journal articles, I have included the citation count via *google*. underline: students or postdoc; asterisk: corresponding author.

### Refereed Journal Publications

1. *Kernel-free boundary integral method for a Stokes interface problem*, with H. Dong, W. Ying, and J. Zhang, in review.
2. *Mathematical Modeling of Non-Small Cell Lung Cancer Response to Therapy*, with E. Turian, Russell Injerd, in review.
3. *Numerical study on Deltaic shoreline evolution*, with M. Zhao, V. Voller, in review.

### Refereed Journal Publications—published or accepted

4. M. Lu, C. Liu, S. Li\*, *Nonlinear simulation of an elastic tumor-host interface*, Computational and Mathematical Biophysics, in press, 2019.
5. M. Zhao, G. Salter, V. Voller, S. Li, *Can the growth of deltaic shoreline be unstable*, Earth Surface Dynamics, in press, 2019.
6. E. Turian, K. Liu, J. Lowengrub, S. Li\*, *Morphological stability of an elastic tumor-host interface*, J. Comp. Appl. Math, in press.
7. M. Zhao, X. Li, W. Ying, A. Belmonte, J. Lowengrub, S. Li\*, *Computation of a shrinking interface in a Hele-Shaw cell*, Siam J. Sci. Comput., in press.
8. Kara Pham, E. Turian, K. Liu, S. Li\* and J. Lowengrub, *Nonlinear dynamics of a tumor growing in Stokes flow*, J. Math Biology, in press.

9. D. Li, M. Zhao, S. Li, *On the transition probability for the near or exact resonance by RWA*, Int. J. Theor. Phys., in press.
10. W. Hao, B. Hu, S. Li, L. Song, *Convergence of boundary integral method for a free boundary system*, J. Comp. Appl. Math, in press.
11. M. Zhao, W. Ying, J. Lowengrub and S. Li\*, *An efficient adaptive rescaling scheme for computing moving interface problems*, Commun. Comput. Phys., **21**, 679-691, 2017. [Times Cited: 1]
12. K. Liu, G. Marple, J. Allard, S. Li\*, S. Veerapaneni, J. Lowengrub, *Dynamics of a multicomponent vesicle in shear flow*, Soft Matter, **13**, 3521-3531, 2017. [Times Cited: 2]
13. K. Liu, C. Hamilton, J. Allard, J. Lowengrub, and S. Li\*, *Wrinkling Dynamics of Fluctuating Vesicles in Time-Dependent Viscous Flow*, Soft Matter (cover page article), **12**, 5663-5675, 2016. [Times Cited: 1]
14. M. Zhao, A. Belmonte, S. Li\*, X. Li and J. Lowengrub, *Nonlinear simulations of elastic fingering in a Hele-Shaw cell*, J. Comp. Appl. Math, **37**, 394-407, 2016. [Times Cited: 6]
15. H. Feng, A. Cordoba, F. Hernandez, T. Indei, S. Li, and X. Li and J. Schieber, *A boundary integral method for motion of particles in unsteady Stokes and linear viscoelastic flows*, Int. J. Num. Meth. Fluids, **82**, 198-217, 2016. [Times Cited: 2]
16. Anita Thomas, Martin Ratliff and S. Li, *A Rotation Scheme for Accurately Computing Meteoroid Flux*, SIAM Undergraduate Research Online (SIURO), Sept. 2014.
17. K. Liu and S. Li\*, *Nonlinear Simulation of a Vesicle Wrinkling*, Math Method Appl. Sci., **37**, 1093-1112, 2014. [Times Cited: 5]
18. H. Feng, A. Barua, S. Li, and X. Li, *A parallel adaptive treecode algorithm for evolution of elastically stressed solids*, Commun. Comput. Phys., **15**, 365-387, 2014. [Times Cited: 4]
19. A. Barua, S. Li\*, H. Feng, X. Li and J. Lowengrub, *An efficient rescaling algorithm for simulating the evolution of multiple elastic precipitates*, Commun. Comput. Phys., **14**, 940-959, 2013. [Times Cited: 4]
20. F. Haußer, W. Marth, S. Li, J. Lowengrub, A. Rätz, A. Voigt, *Thermodynamically consistent models for two-component vesicles*, Int. J. Biomath. Biostat., **2**, 19-48, 2013. [Times Cited: 13]

21. A. Barua, S. Li\*, X. Li and J. Lowengrub, *Self-similar evolution of a precipitate in inhomogeneous elastic media*, J. Cryst. Growth, **351**, 62–71, 2012. [Times Cited: 3]
22. J. Sohn, S. Li, X. Li and J. Lowengrub, *Axisymmetric multicomponent vesicles: A comparison of hydrodynamic and geometric models*, Int. J. Numer Method Biomed Eng., **28**, 346–368, 2012. [Times Cited: 9]
23. S. Li\*, J. Lowengrub and A. Voigt, *Locomotion, wrinkling, and budding of a multicomponent vesicle in viscous fluids*, Comm. Math. Sci., **10**, 645–670, 2012. [Times Cited: 9]
24. S. Li\* and X. Li, *A Boundary Integral Method for Computing the Dynamics of an Epitaxial Island*, Siam J. Sci. Comput., **33**, 3282–3302, 2011. [Times Cited: 7]
25. J. Sohn, Y.-H. Tseng, S. Li, J. Lowengrub, A. Voigt, *Dynamics of multicomponent vesicles in a viscous fluid*, J. Comput. Phys., **229**, 119–144, 2010. [Times Cited: 77]
26. S. Li\*, J. Lowengrub, J. Fontana and P. Palffy-Muhoray, *Control of viscous fingering patterns in a radial Hele-Shaw Cell*, Phys. Rev. Lett., **102**, 174501, 2009 (cover page article). [Times Cited: 103]
27. S. Li, X. Li, J. Lowengrub and M. Glicksman, *A deterministic mechanism for side-branching in dendritic growth*, Fluid Dynamics and Materials Processing, **4**, 27–42, 2008. [Times Cited: 2]
28. S. Li, J. Lowengrub, P. Leo, *A rescaling scheme with application to the long time simulation of viscous fingering in a Hele-Shaw cell*, J. Comput. Phys., **225**, 554–567, 2007. [Times Cited: 60]
29. Z. Hu, S. Li, J. Lowengrub, *Morphological stability analysis of the epitaxial growth of a circular island: application to nanoscale shape control*, Physica D: Nonlinear Phenomena, **233**, 151–166, 2007. [Times Cited: 11]
30. M. Glicksman, J. Lowengrub, S. Li, X. Li, *A deterministic mechanism for dendritic solidification kinetics*, J. The Minerals, Metals & Materials Society, **59**, issue 8, 27–34, 2007. [Times Cited: 22]

31. S. Li, J. Lowengrub, P. Leo and V. Cristini, *Nonlinear Stability Analysis of Self-Similar Crystal Growth: Control of the Mullins-Sekerka Instability*, J. Cryst. Growth, **277**, 578–592, 2005.  
[Times Cited: 35]
32. S. Li, J. Lowengrub, P. Leo, *Nonlinear Morphological Control of growing Crystals*, Physica D: Nonlinear Phenomena, **208**, 209–219, 2005.  
[Times Cited: 21]
33. S. Li, J. Lowengrub, P. Leo and V. Cristini, *Nonlinear Theory of Self-Similar Crystal Growth and Melting*, J. Cryst. Growth, **267**, 703–713, 2004.  
[Times Cited: 31]

### Refereed Proceedings Papers

34. M. Zhao, J. Lowengrub and S. Li\*, *An efficient adaptive rescaling scheme for computing Hele-Shaw problems*, XXIV ICTAM, 21-26 August 2016, Montreal, Canada, 2016.
35. H. Feng, A. Barua, X. Li, and S. Li\*, *An adaptive treecode algorithm for computing the evolution of microstructures in an elastic media*, Contemporary Mathematics, **586**, 153–161, 2013. [Times Cited: 1]
36. S. Torabi, S. Li, S. Wise, A. Voigt, J. Lowengrub, *Simulations of Nonlinear Strongly Anisotropic, Misfitting Crystals and Thin Films*, Mater. Res. Soc. Symp. Proc. Vol. **1087**, 2008.  
[Times Cited: 2]
37. Z. Hu, S. Li, J. Lowengrub, S. Wise, A. Voigt, *Phase field modeling of nanoscale island dynamics*, Proc. TMS, Vol. **1**, 111, 2008.  
[Times Cited: 2]
38. M. Glicksman, J. Lowengrub, S. Li, *Non-monotone Temperature Boundary Conditions in Dendritic Growth*, Proc. Modeling of Casting, Welding and Adv. Solid Processes XI, Eds. C.A. Gandin, M. Bellet, 521-528, 2006.  
[Times Cited: 5]
39. S. Li, X. Li, J. Lowengrub, P. Leo and V. Cristini, *Nonlinear Crystal Growth and Control of the Mullins-Sekerka Instability*, MRS Proceedings 859E (JJ5.5), Eds. J. Evans, C. Orme, M. Asta and Z. Zhang, 2005.

### Preprints

40. *Oscillatory solid particles in a linear viscoelastic fluid*, with H. Feng and X. Li.



41. *A Boundary Integral Method for Computing the Forces of Moving Beads in a 3-Dimensional Linear Viscoelastic Flow*, with F. Hernandez and X. Li
42. *Analytical Approach for Calculating Magnetic Field Distribution in Surface Mount PM Motor with Stator Slots*, with Y. Jiang and M. Krishnamurthy.
43. *On the scaling of dendritic tip*, with A. Barua, X. Li, and P. Leo.
44. *The effect of therapy on tumor regression: a lung carcinoma study*, with E. Turian and J. Turian.

### **Work in Progress**

45. *Nonlinear simulation of tumor growth in a viscoelastic fluid*, with Emma Turian
46. *On the thermodynamic limit of an epitaxial island*, with X. Li.
47. *Self-similar evolution of multiple precipitates in an elastic media*, with A. Barua, X. Li, J. Lowengrub and P. Leo.
48. *On self-similar evolution mediated by an anisotropic energy*.

### **Other publications**

49. S. Li, *Morphological Control of Crystal Growth*, Ph.D. Thesis, University of Minnesota, 2005.
50. S. Li, P. Leo, J. Lowengrub, and V. Cristini, *Morphological Control of 2D Crystal Growth—Effect of Kinetics*, University of Minnesota Supercomputing Institute, UMSI 2002, No.78, May 2002.
51. S. Li, P. Leo, J. Lowengrub, and V. Cristini, University of Minnesota Supercomputing Institute, UMSI 2004, No234, Dec. 2004.
52. S. Li, P. Leo, J. Lowengrub, and V. Cristini, University of Minnesota Supercomputing Institute, UMSI 2004, No235, Dec. 2004.

## **2.5 Students and Postdocs Advised**

### **High School Students**

- Vishesh Verma (Stevenson high school, Chicago).
- Johnny Li, (St. Margaret's Episcopal School, San Juan Capistrano, CA).

### **Undergraduate Students**

- Erich W. Ruszczak (B.S. Spring 2010)

- Anita Thomas (B.S. Spring 2013).
- Caleb Hamilton (B.S. Spring 2015).
- Junru Xu (B.S. Spring 2018)

### **Master Students**

- You Yu (M.S. Spring 2010. )
- Qing Huangfu (M.S. Spring 2010)
- Meng Zhao (M.S. Fall 2013)
- Caleb Hamilton (M.S. Spring 2015).
- Catherine N. Langman (M.S. Spring 2016).

### **Ph.D Students**

- Amlan Barua (Joint with Prof. Xiaofan Li, Aug. 2012). Thesis topic: A numerical and analytical study of microstructure evolution.
- Kai Liu (Ph.d, Sept. 2014). Thesis topic: Nonlinear simulations and analysis of a biomembrane.
- Emma Turian (Ph.d, Spring 2016). Thesis topic: An analytical and computational study of tumor growth.
- Meng Zhao (Ph.d, May 2017). Thesis topic: A curvature weakening model and its applications in fluids and materials.
- Francisco Hernandez (joint with Xiaofan Li, Ph.d, 2017). Thesis topic: A numerical study of viscoelastic fluids.
- Yue Cao (Ph.d, 2020 expected) Thesis topic: Efficient numerical methods for interface problems in complex flow domains.

### **Postdoc**

- Hualong Feng (Joint with Prof. Xiaofan Li, 2011–2013) Research topic: Fast summation algorithms for boundary integral methods; linear viscoelastic fluids.

## **2.6 Colloquia and Seminars**

1. Gave 25+ Colloquium talks at Universities and Labs; 70+ invited talks at Conferences and meetings.

## 2.7 Teaching at IIT

The average teaching evaluation score: 4.3 out of 5.

## 3 Service

### 3.1 University Committee

**Main Campus Faculty Council-Academic Computing Committee**, member 2012 - present. During the period, I have participated in an effort to upgrade the email system of IIT.

**University Research Council Representative**, Fall 2013 ~ Fall 2016.

**University Campus Committee on Promotion and Tenure**, since 2016.

### 3.2 Departmental Committees

**Graduate Students Committee**, Applied Math Dept. IIT, Since 2016.

**Department Colloquium series Committee**, Applied Math Dept. IIT, Since 2017.

**Faculty Search Committee**, Applied Math Dept. IIT, 2017–2018.

**Chair Search Committee**, Applied Math Dept. IIT, 2016–2017.

**Senior Lecture Search Committee**, Applied Math Dept. IIT, 2016–2017.

**Faculty Search Committee**, Applied Math Dept. IIT, 2012 and 2013.

**Faculty Search Committee**, Physics Department, IIT, 2013.

**Faculty advisor of SIAM student Chapter**, since Fall 2012.

**Colloquium Coordinator**, Fall 2010, 2011, Spring 2011.

**Certification Committee for Computational Mathematics**

**Poster Judge/organizer for Karl Menger Event**

### **3.3 Ph.D. Committees**

Served 30+ Ph.D comprehensive exam and final defense committee.

## **4 Professional Activities**

### **4.1 Meeting Organization**

- Organized a minisymposium “Theory, Modeling and Computation of Moving Interface Problems in Materials Science” at SIAM Conference on Mathematical Aspects of Materials Science (MS10), Philadelphia, May 2010.
- Organized a minisymposium “The Boundary Integral Method and its Applications” at ICIAM meeting, Vancouver Canada. July. 2011.
- Organized a minisymposium “Recent advances in interfacial dynamics and its applications” at SIAM Annual meeting, Chicago. July. 2014.
- Organized a minisymposium “Recent Advances of Membrane Modeling and Computation” at SIAM Life Science meeting, Charlotte NC, Aug. 2014; and Boston, July 2016.
- Organized a minisymposium “Modeling Lipid Membrane at Cellular to Sub-Cellular Scales: Numerical Simulations” at SIAM Life Science meeting, Minneapolis MN, Aug. 2018.
- Co-Organized the 2018 Midwest Mechanics of Materials and Structures Workshop at IIT. Aug. 9, 2018, with Profs. Ankit Srivastava and Murat Vural.

### **4.2 Journal Paper/Proposal Reviews**

Served as a reviewer for more than 20 journals, and funding agencies.