Longfei Li

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Ph.D. in Applied Mathematics, August 2014, University of Delaware.
M.S. in Applied Mathematics, May 2011, University of Delaware.
B.S. in Mathematics, June 2009, Sichuan University, China.

Professional Experiences

Assistant Professor, Department of Mathematics, University of Louisiana at Lafayette, Lafayette, LA, August 2017 – present.

Margaret A. Darrin Postdoctoral Fellow, Department of Mathematical Sciences, Rensselaer Polytechnic Institute, Troy, NY, September 2014 – August 2017.
Advisor: Dr. William D. Henshaw

Gore Modeling and Simulation Summer Intern, W. L. Gore & Associates, Elkton, MD, June 2014 – August 2014.

Long-term Visitor, the Institute for Mathematics and its Applications (IMA), University of Minnesota, Minneapolis, MN, February 2014 – March 2014.

Research Assistant, Department of Mathematical Sciences, University of Delaware, Newark, DE, September 2010 – July 2014.
Advisor: Dr. Richard J. Braun

Publications

"Numerical methods for thermally stressed shallow shell equations," H. Ji and L. Li, submitted to *J. Comput. Appl. Math.* (2017).

"Computed flow and fluorescence over the ocular surface," L. Li, R. J. Braun, W. D. Henshaw and P. E. King-Smith, *Math. Med. Biol.* dqx011 (2017).

"A stable partitioned FSI algorithm for incompressible flow and deforming beams," L. Li, W. D. Henshaw, J. W. Banks, D. W. Schwendeman and G. A. Main, *J. Comput. Phys.* 312, 272–306 (2016).

"Computed tear film and osmolarity dynamics on an eye-shaped domain," L. Li, R. J. Braun, T. A. Driscoll, W. D. Henshaw, J. W. Banks and P. E. King-Smith, *Math. Med. Biol.* 33, 123–157 (2016).

"Dynamics and function of the tear film in relation to the blink cycle," R. J. Braun, P. E. King-Smith, C. G. Begley, L. Li and N. R. Gewecke, *Prog. Retin. Eye Res.* 45, 132–164 (2015).

"Tear film dynamics with evaporation, wetting and time-dependent flux boundary condition on an eye-shaped domain," L. Li, R. J. Braun, K. L. Maki, W. D. Henshaw and P. E. King-Smith, *Phys. Fluids* 26, 052101 (2014). (**Editor selected research highlight with a press release**)

"A model for the human tear film with heating from within the eye," L. Li and R. J. Braun, *Phys. Fluids* 24, 062103 (2012). (**Editor selected research highlight**)

"Mathematical models and numerical methods for human tear film dynamics," L. Li, *Ph.D. thesis University of Delaware* (2014).

Preprints to be submitted

"A stable and second-order accurate finite-difference scheme for solving generalized Euler-Bernoulli beam model with application to fluid-structure interaction problems," L. Li, W. D. Henshaw, J. W. Banks and D. W. Schwendeman (preprint available upon request).

"Split-step finite-element methods for incompressible Navier-Stokes equations with high-order accuracy up-to the boundary," L. Li, W. D. Henshaw, F. Li and J. W. Banks (preprint available upon request).

In preparation

"Parallel computation of fluid-structure interactions involving incompressible flow and deforming beams," L. Li, and W. D. Henshaw

"A stable partitioned FSI algorithm for incompressible flow and deforming beams in 3D," L. Li, W. D. Henshaw, J. W. Banks and D. W. Schwendeman

Grants

PI: FSI algorithm for flow and deforming beams, *Louisiana Optical Network Infrastructure (LONI) High Performance Computing*, 2017–2018 (50,000 CPU hours).

PI: High-order computational methods for beams and plates with applications to fluid-structure interaction problems, *Louisiana Board of Regents Office of Sponsored Programs RCS Fund*, 2018–2021 (submitted).

Software

I am a member of the development team of the Overture object-oriented parallel framework for solving PDEs in complex moving geometry. The software is freely available from *www.OvertureFramework.org*.

Publicity

"Working to cure 'dry eye' disease." May 2014, *phys.org*, *Yahoo!News* and *ScienceDaily.com*.

"Theory meets experiment in the blink of an eye: an ocular puzzle is resolved in a new numerical simulation of human tears." Stephen G. Benka, July 2012, *Physics Today*.

"Mathematicians model heat flow in human tears." June 2012, *phys.org*.

Honors & Awards

FACM '15 Travel Award, New Jersey Institute of Technology (NJIT), June 2015.

Unidel Fellowship, University of Delaware, Spring 2014.

American Physical Society DFD 66th Annual Meeting Travel Grant, Pittsburgh, PA, November 2013.

FACM '13 Travel Award, New Jersey Institute of Technology (NJIT), June 2013.

Winter Research Symposium Honorable Mention, University of Delaware, February 2013.

Editor Selected Research Highlight of the Journal "*Physics of Fluids*," June 2012.

Mathematics-in-Eyes Study Group Travel Award, Oxford University, Oxford, UK, July 2011.

Groups Exploring the Mathematical Sciences (GEMS) Fellow, University of Delaware, Summer 2010.

Excellent Graduate (comparable to the Dean's List), Sichuan University, China, June 2009.

Teaching Experience

University of Louisiana, Lafayette, LA

Spring 2018, MATH 556: Numerical Analysis II (graduate level)

Fall 2017, MATH 555: Numerical Analysis I (graduate level)

Fall 2017, MATH 250: Survey of Calculus

Rensselaer Polytechnic Institute, Troy, NY

September 2014 – August 2017, participated in mentoring the graduate students of our research group

University of Delaware, Newark, DE

Winter 2014, MATH 243: Analytic Geometry & Calculus C

Winter 2013, MATH 243: Analytic Geometry & Calculus C

Spring 2010, MATH 241: Analytic Geometry & Calculus A (TA)

Fall 2009, MATH 243: Analytic Geometry & Calculus C (Grader)

Fall 2009, MATH 242: Analytic Geometry & Calculus B (Grader)

Professional Service

Referee for

SIAM Journal on Applied Mathematics
Journal of Fluid Mechanics
Journal of Fluids and Structures
Journal of Engineering Mathematics
International Journal for Numerical Methods in Engineering

Conference, minisymposium and workshop (co-)organized

Minisymposium on *Advances in Computational Methods for Multiphysics Problems* at the SIAM Conference on Computational Science and Engineering (CSE17), Atlanta, GA, February, 2017

Minisymposium on *Advances in Computational Methods for Fluid-Structure Interaction Problems* at the 2016 SIAM Annual Meeting, Boston, MA, July, 2016

Invited Seminars

"Overcoming the added-mass instability for coupling incompressible flows and elastic beams," College of Mathematics, Sichuan University, Chengdu, China, December, 2017.

"Overcoming the added-mass instability for coupling incompressible flows and elastic beams," School of Mathematical Sciences, University of Electronic Science and Technology of China, Chengdu, China, December, 2017.

"Computed flow and fluorescence over the ocular surface," Department of Mathematics Colloquium, University of Louisiana at Lafayette, Lafayette, LA, September, 2017.

"Asymptotically Well-posed Boundary Conditions for Partitioned Fluid-Structure Algorithms," Computational Science Seminar, University of Massachusetts Dartmouth, Dartmouth, MA, May, 2017.

"Asymptotically Well-posed Boundary Conditions for Partitioned Fluid-Structure Algorithms," Department of Mathematics Colloquium, University of Louisiana at Lafayette, Lafayette, LA, March, 2017.

"Asymptotically Well-posed Boundary Conditions for Partitioned Fluid-Structure Algorithms," Theoretical Division T-5: Applied Mathematics and Plasma Physics, Los Alamos National Laboratory (LANL), Los Alamos, NM, March, 2017.

"High-Performance Computational Methods for Multi-physics problems in Complex Domains," Department of Mathematics and Statistics Colloquium, University at Albany, State University of New York Albany, NY, March, 2017.

"Added-mass partitioned (AMP) algorithm for the deforming beam and fluid interaction," Center for Applied and Computational Mathematics Seminar, Rochester Institute of Technology, Rochester, NY, September 2016.

"A stable partitioned FSI algorithm for incompressible flow and deforming beams," Applied and Computational Mathematics Seminar, George Mason University, Fairfax, VA, March 2016.

"A stable partitioned FSI algorithm for incompressible flow and deforming beams," Applied Mathematics Seminar, University of Delaware, Newark, DE, February 2016.

"Overcoming the added-mass instability for coupling incompressible flows and elastic beams," Computational Science and Engineering seminar at Scientific Computation Research Center (SCOREC), Rensselaer Polytechnic Institute, Troy, NY, September 2015.

"Mathematical models and numerical methods for human tear film dynamics," Center for Applied and Computational Mathematics Seminar, Rochester Institute of Technology, Rochester, NY, September 2014.

"A model coupling tear film and osmolarity dynamics on the eye," Applied Mathematics Seminar, University of Delaware, Newark, DE, March 2014.

"A model coupling tear film and osmolarity dynamics on the eye," Mathematical Biology Seminar, University of Minnesota, Minneapolis, MN, February 2014.

Conference and Workshop Presentations

Presentations

Minisymposium talk at the 3rd Annual Meeting of SIAM Central States Section, "A Split-Step Finite-Element Method for Incompressible Navier-Stokes Equations with High-Order Accuracy up-to the Boundary," Fort Colins, CO, September, 2017.

Minisymposium talk at SIAM Conference on Computational Science and Engineering (CSE), "A Split-Step Finite-Element Method for Incompressible Navier-Stokes Equations with High-Order Accuracy up-to the Boundary," Atlanta, GA, February, 2017.

Minisymposium talk at SIAM Conference on Computational Science and Engineering (CSE), "Added-Mass Partitioned (AMP) Algorithm for the Deforming Beam and Fluid Interaction," Atlanta, GA, February, 2017.

13th Symposium on Overset Composite Grids and Solution Technology, "A stable partitioned FSI algorithm for incompressible flow and deforming beams," Future of Flight Aviation Center, Mukilteo, WA, October, 2016.

Minisymposium talk at SIAM Annual Meeting, "A stable partitioned FSI algorithm for incompressible flow and deforming beams," Boston MA, July 2016.

Applied Math Days, "A stable partitioned FSI algorithm for incompressible flow and deforming beams," Troy NY, April 2016.

Frontiers in Applied and Computational Mathematics (FACM '15), "Overcoming the added-mass instability for coupling incompressible flows and elastic beams," New Jersey Institute of Technology, Newark, NJ, June 2015.

Minisymposium talk at SIAM Conference on Computational Science and Engineering (CSE), "Overcoming the added-mass instability for coupling incompressible flows and elastic beams," Salt Lake City, UT, March 2015.

The 66th Annual Meeting of the APS Division of Fluid Dynamics, "Coupling osmolarity dynamics within human tear film on an eye-shaped Domain," Pittsburgh, PA, November 2013.

Frontiers in Applied and Computational Mathematics (FACM '13), "Modeling tear film dynamics with time dependent flux boundary conditions on a 2D eye-shaped domain," New Jersey Institute of Technology, Newark, NJ, June 2013.

The 65th Annual Meeting of the APS Division of Fluid Dynamics, "Modeling tear film dynamics on a 2-D eye-shaped domain," San Diego, CA, November 2012.

Mid Atlantic Numerical Analysis Day, "Tear film dynamics on an eye-shaped domain," Temple University, Philadelphia, PA, November 2012.

Hallenbeck Graduate Student Seminar, "Modeling tear film on a 2D eye-shaped domain," University of Delaware, Newark, DE, September 2012.

Minisymposium talk at SIAM Annual Meeting, "Tear film dynamics on an eye-shaped domain," Minneapolis, MN, July 2012.

The 64th Annual Meeting of the APS Division of Fluid Dynamics, "Tear film dynamics and cooling of the anterior eye," Baltimore, MD, November 2011.

Minisymposium talk at the 7th International Congress on Industrial and Applied Mathematics (ICIAM), "Tear film dynamics and cooling of the anterior eye," Vancouver, Canada, July 2011

SIAM Mid-Atlantic Regional Applied Mathematics Student Conference, "A model for the human tear film with heating from within the eye," Shippensburg, PA, April 2011.

Posters

SIAM Conference on Computational Science and Engineering (CSE15), "Computed tear film and solute dynamics on an eye-shaped domain," Salt Lake City, UT, March 2015.

The 7th International Conference on the Tear Film & Ocular Surface, "Computed tear film and osmolarity dynamics on an eye-shaped domain," Taormina, Italy, September 2013.

University of Delaware Winter Research Symposium, "Tear film dynamics on an eye-shaped domain," February, 2013.

University of Delaware Winter Research Symposium, "A model for the human tear film with heating from within the eye," February, 2012.

Workshops

"Frozen shapes: thin nearly flat elastic shells with stretching and bendings (Corning Inc.)," Mathematical Problems in Industry, University of Delaware, Newark, DE, June 2015.

"Structure-performance relations in fibrous materials (W. L. Gore & Associates)," Mathematical Problems in Industry, New Jersey Institute of Technology, Newark, NJ, June 2014.

IMA Annual Program Year Workshop: Topological Structures in Computational Biology, University of Minnesota, December 2013.

"Fuel cell assembly process flow for high productivity (Bloom Energy)," Mathematical Problems in Industry, University of Delaware, Newark, DE, June 2012.

"Modeling sterling engine," Graduate Student Mathematical Modeling Camp, Rensselaer Polytechnic Institute, Troy, NY, June 2012.

"Glaucoma, fluid flow and the starling resistor," Mathematics-in-Eyes Study Group, Oxford University, Oxford, UK, July 2011.

Computer Skills

C/C++, Python, Perl, MPI, Fortran, Matlab, LaTeX, Overture, FreeFEM++, and shell scripting.