David B. Stein

Contact Information

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Research Interests

Fluid dynamics, complex and active media, non-newtonian fluids, fluid-structure interaction, partial differential equations, high-accuracy numerical methods

Education

University of California, Davis, Davis, CA

Ph.D., Applied Mathematics, September 2016

- Dissertation: The Immersed Boundary Smooth Extension (IBSE) Method: A Flexible and Accurate Fictitious Domain Method, and Applications to the Study of Polymeric Flow in Complex Geometries
- Advisor: Professor Becca Thomases

Amherst College, Amherst, MA

B.A., Mathematics and Physics, *cum laude*, May 2006

- Undergraduate Thesis: A Test of Special Relativity - Pushing down the Limits on a Possible Violation of Local Lorentz Invariance
- Undergraduate Thesis Advisor: Professor Larry R. Hunter

Professional Experience

Research Scientist April 2019 - present
Biophysical Modeling Group, Flatiron Institute, Simons Foundation, New York NY

Flatiron Research Fellow September 2016 - April 2019
Biophysical Modeling Group, Flatiron Institute, Simons Foundation, New York NY

Academic Research Officer October 2009 - April 2010
Center for Burden of Disease and Cost Effectiveness
University of Queensland, Brisbane, QLD, Australia

Consultant March 2009 - May 2009
International Training and Education Center for Health, Gabarone, Botswana

Post-bachelor Fellow September 2007 - July 2009
Institute for Health Metrics and Evaluation, Seattle, WA

Publications

[1] (*in preparation*) R Farhadifar, G Fabig, C Yu, H Wu, **DB Stein**, M Rockman, T Müller-Reichert, MJ Shelley, D Needleman. Force Balance from Stoichiometric Microtubule-Motor Interactions Sets Final Spindle Length, Positioning, and Scaling.

[2] (*in preparation*) G de Canio, **DB Stein**, E Lauga, RE Goldstein, MJ Shelley. Swirling Instability of the Microtubule Cytoskeleton.

[3] (*in preparation*) **DB Stein**, S Veerapaneni, MJ Shelley. A hybrid integral equation method for simulating viscoelastic flows in confined domains.

[4] (*in preparation*) J Huang, MJ Shelley, **DB Stein**. Solving Stefan problem with natural convection using Immersed Boundary Smooth Extension (IBSE).

[5] (submitted to *Physical Review Letters*) N Oppenheimer, **DB Stein**, MJ Shelley. Fast crystallization of rotating membrane proteins.

[6] (Accepted for publication in *Physical Review Fluids*) **DB Stein**, MJ Shelley. Coarse-graining the dynamics of immersed and driven fiber assemblies.

[7] (2019) **DB Stein**, RD Guy, B Thomases. Convergent solutions of Stokes Oldroyd-B boundary value problems using the Immersed Boundary Smooth Extension (IBSE) Method. *Journal of Non-Newtonian Fluid Mechanics*

[8] (2017) **DB Stein**, RD Guy, B Thomases. Immersed Boundary Smooth Extension (IBSE): A high-order method for solving incompressible flows in arbitrary smooth domains. *Journal of Computational Physics*.

[9] (2016) **DB Stein**, RD Guy, B Thomases. Immersed Boundary Smooth Extension: A high-order method for solving PDE on arbitrary smooth domains using Fourier spectral methods. *Journal of Computational Physics*.

[10] (2012) SK Peck, DK Kim, **DB Stein**, D Orbaker, A Foss, MT Hummon, and LR Hunter. Limits on local Lorentz invariance in mercury and cesium. *Physical Review A*.

[11] (2008) SS Lim, **DB Stein**, A Charrow, CJL Murray. Tracking progress towards universal childhood immunisation and the impact of global initiatives: a systematic analysis of three-dose diptheria, tetanus, and pertussis immunisation coverage. *The Lancet*.

Conference Presentations and Invited Talks

- SIAM Conference on Computational Science and Engineering — March, 2019
- APS Division of Fluid Dynamics Annual Meeting — November, 2018
- Flatware Conference, Flatiron Institute — October, 2018
- Complex Fluids in Biological Systems (BIRS) — July, 2018
- SIAM Annual Meeting — July, 2018
- APS Division of Fluid Dynamics Annual Meeting — November, 2017
- Modeling Complex Fluids and Gels for Biological Applications — May, 2017
- Society of Rheology Annual Meeting — February, 2017
- APS Division of Fluid Dynamics Annual Meeting — November, 2016
- SIAM Conference on Analysis of Partial Differential Equations — December, 2015
- APS Division of Fluid Dynamics Annual Meeting — November, 2015
- Applied Math Lab Seminar, Courant Institute, New York University — October, 2015
- Applied Math and PDE Seminar, University of California, Davis — October, 2015
- SIAM Conference on Computational Science and Engineering — March, 2015
- APS Division of Fluid Dynamics Annual Meeting — November, 2014
- UC Davis Student Run Applied Math Seminar — 2012, 2013, 2015

Awards

Forris Jewett-Moore Fellow, 2010, 2011
Amherst Memorial Fellow, 2014

National Science Foundation
- VIGRE support, Spring, 2012
- VIGRE Summer Research Fellowship, 2012
- Graduate Research Fellowship Honorable Mention, 2012

US Department of Education GAANN Grant (Graduate Assistance in Areas of National Need), 2011-2012

Howard Hughes Medical Institute (HHMI) Undergraduate Research Fellowship, 2004