

Yoichiro Mori

CONTACT INFORMATION	School of Mathematics University of Minnesota 206 Church Street SE Minneapolis, MN 55455	ymori@umn.edu http://www.math.umn.edu/~ymori (612)625-3570
RESEARCH INTERESTS	Mathematical physiology and biophysics, applied and numerical analysis.	
POSITIONS	School of Mathematics, University of Minnesota Minneapolis, MN, USA Professor, 2018-present. Associate Professor, 2013-2018. Assistant Professor, 2008-2013. Department of Mathematics, University of British Columbia Vancouver, BC, Canada Postdoctoral Fellow, August 2006-July 2008.	
EDUCATION	Courant Institute of Mathematical Sciences, New York University New York, NY, USA Ph.D. Mathematics, September 2006. <ul style="list-style-type: none">• Dissertation Title: “Three Dimensional Model of Cellular Electrophysiology”• Advisor: Charles S. Peskin University of Tokyo Tokyo, Japan M.D. Medicine, March 2002.	
AWARDS	2010-2012 2009-2011 2007 2007 2006	McKnight Land Grant Professorship Alfred P. Sloan Foundation Fellow Leslie Fox Prize in Numerical Analysis (First Prize) Kurt O. Friedrichs Prize for Outstanding Dissertation Moses A. Greenfield Research Award for Interdisciplinary Research
FELLOWSHIPS	2005–2006 2002–2004	New York University Graduate School of Arts and Sciences Dean’s Dissertation Fellow New York University Graduate School of Arts and Sciences Henry McCracken Fellow
PUBLICATIONS	Y. Mori, L. Ohm and D. Spirn, <i>Theoretical justification and error analysis for slender body theory</i> accepted, Communications on Pure and Applied Mathematics. A. Moshkforoush, P.A. Valdes-Hernandez, D.E. Rivera, Y. Mori and J. Riera-Diaz, <i>waveCSD: A method for estimating transmembrane currents originated from propagating neuronal activity in the neocortex: Application to study cortical spreading depression</i> , accepted, Journal of Neuroscience Methods. Y. Mori and Y.N. Young, <i>From Electrodifusion Theory to the Electrohydrodynamics of Leaky Dielectrics through the Weak Electrolyte Limit</i> , Journal of Fluid Mechanics,	

855, 67-130, 2018.

M. Nara, Y. Mori and H. Matano, *Asymptotic behavior of spreading fronts in the anisotropic Allen-Cahn equations on \mathbb{R}^n* , accepted, Annales de l'Institut Henri Poincaré.

Y. Mori, A. Rodenberg and D. Spirn, *Well-posedness and global behavior of the Peskin problem of an immersed elastic filament in Stokes flow*, published online, Communications on Pure and Applied Mathematics.

L. Yao and Y. Mori, *A numerical method for osmotic water flow and solute diffusion with deformable membrane boundaries in two spatial dimension*, Journal of Computational Physics, 350, 728-746, 2017.

L. Yao, M.C. Calderer, Y. Mori and R. Siegel, *Rhythmogenic Drug Delivery: Modeling, Analysis and Numerical Simulation*, SIAM Journal of Applied Mathematics, 77(2), 565-592, 2017.

R. O'Connell and Y. Mori, *Effects of Glia in a Triphasic Continuum Model of Cortical Spreading Depression*, Bulletin of Mathematical Biology, 78 (10), 1943-1967, 2016.

N. Wei, Y. Mori and E.G. Talkacheva, *The dual effect of ephaptic coupling on cardiac conduction with heterogeneous expression of connexin 43*, Journal of Theoretical Biology, 397, 103-114, 2016.

Y. Mori and H. Matano, *Stability of Planar Fronts of the Bidomain Equation* Communications in Pure and Applied Mathematics, 69(12), 2364-2426, 2016.

A. Stinchcombe, Y. Mori and C.S. Peskin, *Well-Posed Treatment of Space-Charge Layers in the Electroneutral Limit of Electrodiffusion*, Communications on Pure and Applied Mathematics, 69(12), 2221-2249, 2016.

Y. Li, Y. Mori and S. Sun, *Flow-driven cell migration under external electric fields*, Physical Review Letters, 115(26), 268101, 2015.

Y. Mori, *A multidomain model for ionic electrodiffusion and osmosis with an application to cortical spreading depression*, Physica D, Nonlinear Phenomena, 308, 94-108, 2015.

N. Wei, Y. Mori, and E.G. Talkacheva, *The role of short term memory and conduction velocity restitution in alternans formation*, Journal of Theoretical Biology, 367, 21-28, 2015.

T. Fai, B Griffith, Y. Mori and C.S. Peskin, *Immersed Boundary Method for Variable Viscosity and Variable Density Problems Using Fast Constant-Coefficient Linear Solvers II: Theory*, SIAM. J. Sci. Comput., 36, B589-B621, 2014.

H. Chen, M.C. Calderer and Y. Mori, *Analysis and Simulation of a model of polyelectrolyte gel in one spatial dimension*, Nonlinearity, 27, 1241-1285, 2014.

Stephen D. McIntyre, Virendra Kakade, Yoichiro Mori, Elena G. Talkacheva, *Heart rate variability and alternans formation in the heart: the role of feedback in cardiac dynamics*, Journal of Theoretical Biology, 350, 90-97, 2014.

Y. Liu and Y. Mori, *L^p convergence of the Immersed Boundary Method*, SIAM. J. Num.

Anal., 52, 1, 496-514, 2014.

T. Fai, B Griffith, Y. Mori and C.S. Peskin, *Immersed Boundary Method for Variable Viscosity and Variable Density Problems Using Fast Constant-Coefficient Linear Solvers I: Numerical Method and Results*, SIAM. J. Sci. Comput., 35, B1132-B1161, 2013.

Y. Mori, H. Chen, C. Micek, and M.C. Calderer, *A Dynamic Model of Polyelectrolyte Gels*, SIAM Journal of Applied Mathematics, 73, 104-133, 2013.

Y. Liu and Y. Mori, *Properties of Discrete Delta Functions and Local Convergence of the Immersed Boundary Method*, SIAM J. Num. Anal., 50, 2986-3015, 2012.

Y. Mori, *Mathematical Properties of Pump-Leak Models of Cell Volume Control and Electrolyte Balance*, Journal of Mathematical Biology, Vol. 64, No. 5, p873-916, 2012, *Erratum*, *ibid*.

Y. Mori, C. Liu and R.S. Eisenberg, *A Model of Electrodifffusion and Osmotic Water Flow and its Energetic Structure*, Physica D: Nonlinear phenomena, 240, 1835-1852, 2011.

Y. Mori, A. Jilkinė and L. Edelstein-Keshet, *Asymptotic and bifurcation analysis of wave-pinning in a reaction-diffusion model of cell polarization*, SIAM J. Appl. Math. 71, 1401-1420, 2011.

H. Matano and Y. Mori, *Global existence and uniqueness of a three-dimensional model of cellular electrophysiology*, Discrete and Continuous Dynamical Systems (DCDS-A), Vol. 29, No. 4, 1573-1636, 2011.

M. Brera, J.W. Jerome, Y. Mori and R. Sacco, *A Conservative and monotone mixed-hybridized finite element approximation of transport problems in heterogeneous domains*, Computer Methods in Applied Mechanics and Engineering, Vol. 199, 2709-2720, 2010.

Y. Mori and C.S. Peskin, *A Numerical Method for Cellular Electrophysiology based on the Electrodifffusion Equations with Internal Boundary Conditions at the Membrane*, Communications in Applied Mathematics and Computational Sciences, Vol. 4, No.1, 85-134, 2009.

Y. Mori and C.S. Peskin, *A Universal Programmable Fiber Architecture for the Representation of a General Incompressible Linearly Elastic Material as a Fiber-Reinforced Fluid*, Advances in Applied Mathematics, Vol. 43, No. 1, 75-100, July 2009.

Y. Mori, G.I. Fishman and C.S. Peskin, *Ephaptic conduction in a cardiac strand model with 3D electrodifffusion*, Proc. Natl. Acad. Sci., Vol. 105, no. 17, pp. 6463-6468, 2008.

Y. Mori, A. Jilkinė and L. Edelstein-Keshet, *Wave-pinning and Cell Polarity From a Bistable Reaction-diffusion System*, Biophysical Journal, Vol. 94, pp.3684-3697, 2008.

Y. Mori, *Convergence Proof of the Velocity Field for a Stokes Flow Immersed Boundary Method*, Communications on Pure and Applied Mathematics, 2008, Vol. 61, no. 9, pp. 1213-1263.

Y. Mori and C.S. Peskin, *Implicit Second Order Immersed Boundary Methods with Boundary Mass*, Computational Methods in Applied Mechanics and Engineering, Vol. 197, pp. 2049-2067, Apr. 2008.

Y. Mori, J.W. Jerome and C.S. Peskin, *A Three-Dimensional Model of Cellular Electrical Activity*, Bulletin of the Institute of Mathematics, Academia Sinica, Volume 2, No.2. pp. 367-390, Jun. 2007.

Y. Mori and M. Nakazawa, *A New Simple Etiological Model of Human Death*, Jinkougaku Kenkyuu (The Journal of Population Studies) (33) Nov. 2003.

INVITED TALKS

- Flatiron Institute, New York, NY (Oct. 2018)
- Scuola Normale Superiore, Pisa, Italy (Oct. 2018)
- Meiji Institute of Mathematical Sciences, MIMS/CMMA lecture, Tokyo, Japan (Sept. 2018)
- Banff International Research Station, Oaxaca, Mexico (Aug. 2018)
- New Jersey Institute of Technology (May 2018)
- Midwest Numerical Analysis Day, University of Kansas, plenary speaker (Apr. 2018)
- Meiji Institute of Mathematical Sciences, Tokyo, Japan (Mar. 2018)
- University of Tokyo (Dec. 2017)
- Creighton University (Nov. 2017)
- Fields Institute (Aug. 2017)
- New Jersey Institute of Technology (May 2017)
- National Chiao-Tung University, Hsinchu, Taiwan (Apr. 2017)
- National Taiwan University, Tapei, Taiwan (Apr. 2017)
- Hokkaido University, Sapporo, Japan (Mar. 2017)
- Meiji Institute of Mathematical Sciences, Tokyo, Japan (Jan. 2016)
- Newton Institute, Cambridge, UK (Jul. 2015)
- Riken Center for Developmental Biology, Kobe, Japan (Jun. 2015)
- University of California, Irvine (Mar. 2015)
- National Institutes of Health, Bethesda MD (Dec. 2014)
- Pennsylvania State University (Oct. 2014)
- Florida International University (Sept. 2014)
- Fields Institute, Toronto (Jul. 2014).
- Suzhou University, Suzhou, China (Jun. 2014).
- University of Wisconsin, Madison (Nov. 2013).
- Pennsylvania State University (Oct. 2013).
- IMA workshop, lecturer (Jul. 2013).
- University of Tokyo (Jun. 2013).
- New Jersey Institute of Technology (Nov. 2012)
- Institut des Hautes Études Scientifiques, Paris (Jun. 2012)
- Courant Institute, New York University (Dec. 2011).

- University of Tokyo (Nov. 2011).
- University of Tokyo, Graduate School of Mathematical Sciences (1.5 hour lecture)(Jan. 2011)
- International Conference on Nonlinear PDE and Related Analysis/Applications, Northwestern University, plenary speaker (Mar. 2010).
- University of Tokyo, Graduate School of Mathematical Sciences (two 2 hour lectures)(Jul. 2010)
- University of Wisconsin, Eau Claire, Andrew J. Balas Lecture (Apr. 2009)
- Rush Medical College (Mar. 2009)
- Duke University, Applied Mathematics Seminar. (Feb. 2009)
- University of Tokyo, Graduate School of Mathematical Sciences (three 1.5 hour lectures)(Jan. 2009),
- University of Tokyo, Institute for Industrial Science (Jan. 2009)
- University of Minnesota, Applied Mathematics Seminar (Sept. 2008)
- Politecnico di Milano, Scientific Computing seminar (Jul. 2008)
- University of Tokyo, Applied Analysis seminar (May 2008)
- Massachusetts Institute of Technology, Physical Applied Mathematics seminar (Feb. 2008)
- University of British Columbia, Scientific Computing seminar. (Jan. 2008)
- University of Minnesota, Scientific Computing seminar (Dec. 2007)
- University of Utah, Mathematical Biology seminar. (Oct. 2007)
- Courant Institute, Mathematical Biology seminar. (May 2007)
- Northwestern University, PDE seminar. (May 2007)
- University of Utah, Mathematical Biology seminar. (Jan. 2006)
- University of British Columbia, Mathematical Biology seminar. (Jan. 2006)
- Northwestern University, PDE seminar. (Nov. 2005)
- University of British Columbia, Mathematical Biology seminar. (Oct. 2006)

SERVICES

- Reviewer of SIAM Journal of Applied Mathematics, SIAM Journal of Numerical Analysis, SIAM Journal of Mathematical Analysis, Computer Methods in Applied Mechanics and Engineering, Bulletin of Mathematical Biology, Communications in Computational Physics, Journal of Computational Physics, Mathematics of Computation, Proceedings of the National Academy of Sciences, Journal of fluid mechanics, Physical Biology, Journal of Mathematical Biology, Journal of Computational Neuroscience, Journal of Theoretical Biology, Physica D, etc.
- NSF review panel, 2014, 2015, 2017.
- Organization of IMA workshop "Electrohydrodynamics and Electrodifusion in Material Sciences and Biology", Mar. 2018.
- Organization of IMA workshop "Mathematical Modeling of Cortical Spreading Depression (SD) and Related Phenomena", Feb. 2018.
- Organization of IMA workshop "Mathematics of Biological Charge Transport: Molecules and Beyond", Summer, 2015.
- Organization of GAFOS (German American Frontiers of Science Symposium) in 2009, 2010.

- Organization of minisymposia at SIAM conferences.

TEACHING EXPERIENCE	Spring	2018	Lecturer, MATH 8402 (Methods of Applied Mathematics II)
	Fall	2017	Lecturer, MATH 8401 (Methods of Applied Mathematics I)
	Fall	2016	Lecturer, MATH 2373 (CSE Calculus IV)
	Fall	2016	Lecturer, MATH 8540 (Topics in Mathematical Biology)
	Spring	2016	Lecturer, MATH 8402 (Methods of Applied Mathematics II)
	Fall	2015	Lecturer, MATH 8401 (Methods of Applied Mathematics I)
	Spring	2015	Lecturer, MATH 8540 (Topics in Mathematical Biology)
	Spring	2015	Lecturer, MATH 2373 (CSE Calculus IV)
	Spring	2014	Lecturer, MATH 2373 (CSE Calculus IV)
	Spring	2014	Lecturer, MATH 8402 (Methods of Applied Mathematics, II)
	Fall	2013	Lecturer, MATH 8401 (Methods of Applied Mathematics I)
	Spring	2013	Lecturer, MATH 2574 (Honors Calculus IV)
	Fall	2012	Lecturer, MATH 8540 (Topics in Mathematical Biology)
	Spring	2011	Lecturer, MATH 8402 (Methods of Applied Mathematics II)
	Fall	2010	Lecturer, MATH 8401 (Methods of Applied Mathematics I)
	Spring	2009	Lecturer, MATH 1272 (Calculus II)
	Fall	2008	Lecturer, MATH 8401 (Methods of Applied Mathematics I)
	Spring	2008	Lecturer, MATH 103 (Integral Calculus)
	Spring	2007	Lecturer, MATH 103 (Integral Calculus)
	Summer	2005	Teaching Assistant in Mathematical Biology, Park City Mathematics Institute, Utah
	Spring	2005	Lecturer, Written Exam Workshop (Graduate)
	Summer	2004	Lecturer, Calculus I
	Spring	2004	Lecturer, Written Exam Workshop (Graduate)
	Fall	2003	Teaching Assistant, Quantitative Reasoning
	Spring	2003	Teaching Assistant, Business Calculus

ADVISING

Postdoctoral Fellows:

- Lingxing Yao, 2011-2013

Graduate Students advised:

- Yang Liu, 2009-2011.
- Haoran Chen 2010-2013.
- Minsu Kim 2011-2014.
- Stephen McIntyre 2009-2014.
- Ning Wei, 2011-2016.
- Rosemary O'Connell, 2013-2016.
- Analise Rodenberg, 2013-2018.

Current Graduate Students:

- Austin Tuttle, 2015-present.
- Laurel Ohm, 2015-present.
- María Jesús Muñoz-López, 2016-present.

UNDERGRADUATE SENIOR THESES

Kelly Catlin (Spring 2018), Akshay Bhardwaj (Spring 2016), Meghan Chau (Fall 2015), Jiachen Wang (Spring 2013), Euibin Cheon (Spring 2013), Kristen Steenvoorden (Fall 2011).

FUNDING

- NSF-DMS 1620316 (PI) *Collaborative Research: Algorithm and Theory for Interface Computations*, \$149,998, 2016-2019.
- NSF-DMS 1516978 (PI) *Collaborative Research: Cortical Spreading Depression and Ionic Electrodifffusion in the Brain*, \$195,000, 2015-2018.
- NSF-DMS 1412371 (co-PI) *Collaborative Research: Cortical Spreading Depression: Initiation, Propagation and Recovery*, 2014, recommended for funding but returned to NSF due to illness of collaborator.
- NSF-DMS 0914963 (PI) *A Theoretical and Algorithmic Study of the Immersed Boundary Method*, \$315,059, 2009-2013.
- Alfred P. Sloan Foundation Fellowship, 2009-2011.
- McKnight Foundation Fellowship, 2010-2012.

QUALIFICATIONS

Medical Board Examination, Japan, April 2002
Certified to practice medicine in Japan.