

David M. Bortz

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Math Bio Group: <http://mathbio.colorado.edu>

Google Scholar Profile: <http://bit.ly/14foyvL>

Education

- Ph.D. (2002), M.S. (2000) Applied Mathematics, Advisor: H.T. Banks
North Carolina State University, Raleigh, NC
- B.A. (1997) Computational and Applied Mathematics
Rice University, Houston, TX

Experience

- 2013 – pres. Associate Professor, Department of Applied Mathematics, University of Colorado
- 2011 – pres. BioFrontiers Institute Task Force Member, University of Colorado
- 2011 – pres. Interdisciplinary Quantitative Biology Faculty, University of Colorado
- 2016 Visiting Scholar, Department of Mathematics, Duke University
- 2009 Lecturer, Mathematical Biology Summer School, University of Graz, Austria
- 2006 – 2013 Assistant Professor, Department of Applied Mathematics, University of Colorado
- 2002 – 2006 Post-doctoral Assistant Professor, Department of Mathematics, University of Michigan
- 1998 – 2002 GAANN Fellow and RA with H.T. Banks, N.C. State University
- 1997 – 1998 RA with C.T. Kelley, N.C. State University

Honors

- 2018 U. Colorado Marinus Smith Award (distinguished mentoring/teaching)
- 2016 SAMSI Research Fellow
- 2008 U. Colorado Council on Research & Creative Work Junior Faculty Award
- 2003 U. Michigan Horace H. Rackham Faculty Fellowship
- 1998-2001 DOEd GAANN Computational Science Fellow
- 1998 Argonne National Laboratory Givens Associate
- 1997 N.C. State Univ. Center for Research in Scientific Computation Fellow

Press

- 2015 CU Arts & Sciences Support of Education Through Technology (ASSETT) interview:
Survivor Strategies: Teaching Large Enrollment
- 2012 CU Arts & Sciences Magazine: *For cleaner water, NSF taps CU applied mathematician*
Infection Control Today: *Researchers Discover How Bloodstream Infections Begin*
- 2008 NIGMS Computing Life: *Tracking Bacteria in the Blood*

Preprints

- K. A. Moore, S. L. Altus, J. W. Tay, J. Fox, E. B. Johnson, **D. M. Bortz**, and J. C. Cameron. Mechanical Regulation of Photosynthesis. *Cell*, (submitted), 2018.
- J. T. Nardini and **D. M. Bortz**. The Influence of Numerical Error on an Inverse Problem Methodology in PDE Models. *Inverse Probl.*, (in revision).
- J. A. Stotsky and **D. M. Bortz**. A Posteriori Error Analysis of Fluid-Structure Interactions: Time Dependent Error. *SIAM J. Sci. Comput.*, (submitted), 2018.
- I. Mirzaev and **D. M. Bortz**. On the existence of non-trivial steady-state size-distributions for a class of flocculation equations. *Discrete Contin. Dyn. Syst. - B*, (revised), 2018.
- H. J. Dudley, L. Lu, Z. J. Ren, and **D. M. Bortz**. Sensitivity and Bifurcation Analysis of a Differential-Algebraic Equation Model for a Microbial Electrolysis Cell. *SIAM J. Appl. Dyn. Syst.*, (submitted), 2018
- S. H. Friedman, A. R. A. Anderson, **D. M. Bortz**, A. G. Fletcher, H. B. Frieboes, A. Ghaffarizadeh, D. R. Grimes, A. Hawkins-Daarud, S. Hoehme, E. F. Juarez, C. Kesselman, R. Merks, S. M. Mumenthaler, P. K. Newton, K.-A. Norton, R. Rawat, R. C. Rockne, D. Ruderman, J. Scott, S. S. Sindi, J. L. Sparks, K. Swanson, D. B. Agus, and P. Macklin. MultiCellDS: A community-developed standard for curating microenvironment-dependent multicellular data. *bioRxiv:090456*, (submitted), Nov. 2016.
- S. H. Friedman, A. R. A. Anderson, **D. M. Bortz**, A. G. Fletcher, H. B. Frieboes, A. Ghaffarizadeh, D. R. Grimes, A. Hawkins-Daarud, S. Hoehme, E. F. Juarez, C. Kesselman, R. M. H. Merks, S. M. Mumenthaler, P. K. Newton, K.-A. Norton, R. Rawat, R. C. Rockne, D. Ruderman, J. Scott, S. S. Sindi, J. L. Sparks, K. Swanson, D. B. Agus, and P. Macklin. MultiCellDS: A standard and a community for sharing multicellular data. *bioRxiv:090696*, (submitted), Sept. 2016.
- D. M. Bortz**, A. J. Christlieb, V. Dukic, and A. C. Gilbert. An Emergent Numerical Algorithm for Mesh Generation. 2015 (in revision).

Articles

- [1] J. A. Stotsky, V. Dukic, and **D. M. Bortz**. A Point Process Model for Generating Biofilms with Realistic Microstructure and Rheology. *Eur. J. Appl. Math.*, (accepted), 2018.
- [2] E. P. Kightley, A. Pearson, J. A. Evans, and **D. M. Bortz**. Fragmentation of biofilm-seeded bacterial aggregates in shear flow. *Eur. J. Appl. Math.*, (accepted), 2018.
- [3] J. M. Wentz, A. R. Mendenhall, and **D. M. Bortz**. Pattern Formation in the Longevity-Related Expression of Heat Shock Protein-16.2 in *Caenorhabditis elegans*. *Bull. Math. Biol.*, 80(10):2669–2697, 2018.
- [4] J. T. Nardini and **D. M. Bortz**. Investigation of a Structured Fisher’s Equation with Applications in Biochemistry. *SIAM J. Appl. Math.*, 78(3):1712–1736, 2018.
- [5] V. Dukic and **D. M. Bortz**. Uncertainty Quantification Using Probabilistic Numerics: Application to Models in Mathematical Epidemiology. *Inverse Probl. Sci. Eng.*, 28(2):223–232, 2018.

- [6] I. Mirzaev and **D. M. Bortz**. A numerical framework for computing steady states of structured population models and their stability. *Math. Biosci. Eng.*, 14(4):933–952, Aug. 2017.
- [7] **D. M. Bortz**. Characteristic Roots for Two-Lag Linear Delay Differential Equations. *Discrete Contin. Dyn. Syst. - B*, 21(8), Oct. 2016.
- [8] I. Mirzaev, E. C. Byrne, and **D. M. Bortz**. An Inverse Problem for a Class of Conditional Probability Measure-Dependent Evolution Equations. *Inverse Probl.*, 32(9):095005, Sept. 2016.
- [9] J. A. Stotsky, J. F. Hammond, L. Pavlovsky, E. J. Stewart, J. G. Younger, M. J. Solomon, and **D. M. Bortz**. Variable viscosity and density biofilm simulations using an immersed boundary method, Part II: Experimental validation and the heterogeneous rheology-IBM. *J. Comput. Phys.*, 316:204–222, July 2016.
- [10] J. T. Nardini, D. A. Chapnick, X. Liu, and **D. M. Bortz**. Modeling keratinocyte wound healing: Cell-cell adhesions promote sustained migration. *J. Theor. Biol.*, 400:103–117, July 2016.
- [11] D. D. Keck and **D. M. Bortz**. Generalized sensitivity functions for size-structured population models. *J. Inverse Ill-Posed Probl.*, 24(3):309–321, June 2016.
- [12] I. Mirzaev and **D. M. Bortz**. Laplacian dynamics with synthesis and degradation. *Bull. Math. Biol.*, 77(6):1013–1045, June 2015.
- [13] S. Sircar, E. Aisenbrey, S. J. Bryant, and **D. M. Bortz**. Determining equilibrium osmolarity in poly(ethylene glycol)/chondroitin sulfate gels mimicking articular cartilage. *J. Theor. Biol.*, 364(7 January):397–406, 2015.
- [14] S. M. Kissler, C. Cichowitz, S. Sankaranarayanan, and **D. M. Bortz**. Determination of personalized diabetes treatment plans using a two-delay model. *J. Theor. Biol.*, 359:101–111, Oct. 2014.
- [15] S. Sircar, J. G. Younger, and **D. M. Bortz**. Sticky surface: Sphere–sphere adhesion dynamics. *J. Biol. Dyn.*, 9(Supp. 1):76–89, Aug. 2014.
- [16] J. F. Hammond, E. Stewart, J. G. Younger, M. J. Solomon, and **D. M. Bortz**. Variable Viscosity and Density Biofilm Simulations using an Immersed Boundary Method, Part I: Numerical Scheme and Convergence Results. *Comput. Model. Eng. Sci.*, 98(3):295–340, 2014.
- [17] G. Lambert, A. Bergman, Q. Zhang, **D. M. Bortz**, and R. Austin. Physics of biofilms: The initial stages of biofilm formation and dynamics. *New J. Phys.*, 16(4):045005, Apr. 2014.
- [18] S. Sircar and **D. M. Bortz**. Impact of flow on ligand-mediated bacterial flocculation. *Math. Biosci.*, 245(2):314–321, Oct. 2013.
- [19] A. E. Satorius, J. Szafranski, D. Pyne, M. Ganesan, M. J. Solomon, D. W. Newton, **D. M. Bortz**, and J. G. Younger. Complement C5a Generation by Staphylococcal Biofilms. *Shock*, 39(4):336–342, Apr. 2013.
- [20] E. C. Conrad, Y.-Y. Hsu, **D. M. Bortz**, and J. G. Younger. Spatiotemporal Dynamics of Complement C5a Production within Bacterial Extracellular Polymeric Substance. *J. Innate Immun.*, 5(2):114–123, 2013 (cover art).

- [21] C. W. Curtis and **D. M. Bortz**. Propagation of fronts in the Fisher-Kolmogorov equation with spatially varying diffusion. *Phys. Rev. E*, 86(6), Dec. 2012.
- [22] M. M. Thornton, H. M. Chung-Esaki, C. B. Irvin, **D. M. Bortz**, M. J. Solomon, and J. G. Younger. Multi-cellularity and Antibiotic Resistance in *Klebsiella pneumoniae* Grown Under Bloodstream-Mimicking Fluid Dynamic Conditions. *J. Infect. Dis.*, 206(4):588–595, Aug. 2012.
- [23] J. F. Hammond and **D. M. Bortz**. Analytical solutions to Fisher’s equation with time-variable coefficients. *Appl. Math. Comput.*, 218(6):2497–2508, Nov. 2011.
- [24] E. Byrne, S. Dzul, M. Solomon, J. Younger, and **D. M. Bortz**. Postfragmentation density function for bacterial aggregates in laminar flow. *Phys. Rev. E*, 83(4), Apr. 2011.
- [25] S. P. Dzul, M. M. Thornton, D. N. Hohne, E. J. Stewart, A. A. Shah, **D. M. Bortz**, M. J. Solomon, and J. G. Younger. Contribution of the *Klebsiella pneumoniae* Capsule to Bacterial Aggregate and Biofilm Microstructures. *Appl. Environ. Microbiol.*, 77(5):1777–1782, Mar. 2011.
- [26] C. M. Nypaver, M. M. Thornton, S. M. Yin, D. O. Bracho, P. W. Nelson, A. E. Jones, **D. M. Bortz**, and J. G. Younger. Dynamics of Human Complement–Mediated Killing of *Klebsiella pneumoniae*. *Am. J. Respir. Cell Mol. Biol.*, 43(5):585–590, Nov. 2010.
- [27] H. M. Chung, M. M. Cartwright, **D. M. Bortz**, T. L. Jackson, and J. G. Younger. Dynamical System Analysis of *Staphylococcus Epidermidis* Bloodstream Infection. *Shock*, 30(5):518–526, Nov. 2008 (cover art).
- [28] **D. M. Bortz**, T. L. Jackson, K. A. Taylor, A. P. Thompson, and J. G. Younger. *Klebsiella pneumoniae* Flocculation Dynamics. *Bull. Math. Biol.*, 70(3):745–768, Apr. 2008.
- [29] **D. M. Bortz** and P. W. Nelson. Model Selection and Mixed-Effects Modeling of HIV Infection Dynamics. *Bull. Math. Biol.*, 68(8):2005–2025, Nov. 2006.
- [30] M. S. Ciupe, B. L. Bivort, **D. M. Bortz**, and P. W. Nelson. Estimating kinetic parameters from HIV primary infection data through the eyes of three different mathematical models. *Math. Biosci.*, 200(1):1–27, Mar. 2006.
- [31] I. Ben-David, S. E. Price, **D. M. Bortz**, C. F. Greineder, S. E. Cohen, A. L. Bauer, T. L. Jackson, and J. G. Younger. Dynamics of Intrapulmonary Bacterial Growth in a Murine Model of Repeated Microaspiration. *Am J Respir Cell Mol Biol*, 33(5):476–482, Nov. 2005.
- [32] H. T. Banks and **D. M. Bortz**. A parameter sensitivity methodology in the context of HIV delay equation models. *J. Math. Biol.*, 50(6):607–625, June 2005.
- [33] H. T. Banks and **D. M. Bortz**. Inverse problems for a class of measure dependent dynamical systems. *J. Inverse Ill-Posed Probl.*, 13(2):103–121, Apr. 2005.
- [34] **D. M. Bortz** and P. W. Nelson. Sensitivity analysis of a nonlinear lumped parameter model of HIV infection dynamics. *Bull. Math. Biol.*, 66(5):1009–1026, Sept. 2004.
- [35] H. T. Banks, **D. M. Bortz**, and S. E. Holte. Incorporation of variability into the modeling of viral delays in HIV infection dynamics. *Math. Biosci.*, 183(1):63–91, May 2003.

- [36] **D. M. Bortz**, A. D. Rubio, H. T. Banks, A. B. Cain, and R. C. Smith. Control of open bay acoustics by harmonic mass injection. *Int. J. Aeroacoustics*, 1(1):65–81, Jan. 2002.
- [37] A. B. Cain, A. D. Rubio, **D. M. Bortz**, H. T. Banks, and R. C. Smith. Optimizing Control of Open Bay Acoustics. *Proc. AIAA*, 1928, June 2000.
- [38] I. Ambats, **D. M. Bortz**, A. Connolly, A. Derlicki, M. Derrick, W. Kahle, S. Magill, D. Mikunas, B. Musgrave, J. Schlereth, R. Stanek, and J. Thron. Studies of hadron-electron separators for the ZEUS barrel calorimeter. *Nucl. Instrum. Methods Phys. Res. Sect. Accel. Spectrometers Detect. Assoc. Equip.*, 368(2):364–377, Jan. 1996.

Book Chapters

- [39] **D. M. Bortz**. Chapter 17: Modeling and simulation for nanomaterials in fluids: Nanoparticle self-assembly. In V. Tewary and Y. Zhang, editors, *Modeling, Characterization, and Production of Nanomaterials: Electronics, Photonics and Energy Applications*, volume 73 of *Woodhead Publishing Series in Electronic and Optical Materials*, pages 419–441. Woodhead Publishing Ltd., Cambridge, UK, 2015.
- [40] H. T. Banks, **D. M. Bortz**, G. A. Pinter, and L. Potter. Chapter 6: Modeling and Imaging Techniques with Potential for Application in Bioterrorism. In H. T. Banks and C. Castillo-Chavez, editors, *Bioterrorism: Mathematical Modeling Applications in Homeland Security*, pages 129–154. SIAM, Philadelphia, PA, 2003.
- [41] **D. M. Bortz** and C. T. Kelley. Chapter 5: The Simplex Gradient and Noisy Optimization Problems. In *Computational Methods in Optimal Design and Control*, pages 77–90. Birkhäuser, Boston, MA, 1998.

Refereed Conference Abstracts

- [42] T. Kushner, **D. M. Bortz**, D. Maahs, and S. Sankaranarayanan. A Data-Driven Approach to Artificial Pancreas Verification and Synthesis. In *Proceedings of the 9th ACM/IEEE International Conference on Cyber-Physical Systems*, ICCPS '18, pages 242–252, Porto, Portugal, 2018. IEEE Press.
- [43] **D. M. Bortz**. Eigenvalues for a two-lag linear delay differential equation. *IFAC-PapersOnLine*, 48(12):13–16, 2015.
- [44] E. C. Conrad, A. E. Satorius, P. Sharma, **D. M. Bortz**, and J. G. Younger. The Host Response to Line Sepsis: Experimental and Computational Analysis of Complement Activation against Coagulase-Negative Staphylococcal Biofilms. *Ann. Emerg. Med.*, 62(4):S153, Oct. 2013.
- [45] J. G. Younger, M. M. Thornton, C. Babcock, H. M. Chung-Esaki, **D. M. Bortz**, and M. J. Solomon. Bloodstream-like fluid dynamic conditions promote multicellularity and antibiotic resistance in *Klebsiella pneumoniae*. *Shock*, 37(1):58, 2012.
- [46] M. M. Thornton, D. N. Hohne, M. J. Solomon, **D. M. Bortz**, and J. G. Younger. Bacterial aggregation during growth under low shear: Implications for bacteremia. *Shock*, 31(7):22, 2009.

- [47] S. Yin, C. M. Nypaver, D. O. Bracho, M. Lee, **D. M. Bortz**, A. E. Jones, and J. G. Younger. A real-time assay for identifying complement-mediated bacterial killing defects in septic patients. *Shock*, 31:85, 2009.
- [48] **D. M. Bortz** and A. J. Christlieb. Random Numerical Discretizations. In *Abstracts of the International Conference Inverse Problems: Modeling and Simulation*, pages 29–30, Fethiye, Turkey, 2008.
- [49] D. Li, D. N. Hohne, **D. M. Bortz**, J. Bull, and J. G. Younger. Modeling bacterial clearance from the bloodstream using computational fluid dynamics and Monte Carlo simulation. *J. Crit. Care*, 22(4):344, 2007.
- [50] H. M. Chung, M. M. Cartwright, A. P. Thompson, T. L. Jackson, **D. M. Bortz**, and J. G. Younger. Neutropenic Staphylococcus Epidermidis Bacteremia in a Multicompartment Pharmacokinetic System. *Acad. Emerg. Med.*, 14(5, Suppl. 1):S178–S179, 2007.
- [51] J. G. Younger, H. M. Chung, M. M. Cartwright, **D. M. Bortz**, and T. L. Jackson. Neutropenic S. epidermidis bacteremia modeled as a pharmacodynamic system. *Shock*, 27(Supp. 1):68–69, June 2007.
- [52] D. R. Nemergut, **D. M. Bortz**, and S. C. Reed. Genomic network modeling: An approach to predict net ecosystem processes from microbial community structure data. In *Ecological Society of America Annual Meeting*, 2007.
- [53] **D. M. Bortz**, T. L. Jackson, and J. G. Younger. Estimation and identification of Klebsiella pneumoniae flocculation dynamics. In *Abstracts of the International Conference Inverse Problems: Modeling and Simulation*, pages 15–17, Fethiye, Turkey, 2006.
- [54] **D. M. Bortz**. Accurate Model Selection Computations. *J. Crit. Care*, 21(4):359, 2006.
- [55] J. G. Younger, K. A. Taylor, A. P. Thompson, and **D. M. Bortz**. Bacterial Multicellular Structures and the Genesis of Septic Emboli. *Acad. Emerg. Med.*, 13(5S):S152, May 2006.
- [56] H. M. Chung, T. L. Jackson, **D. M. Bortz**, M. M. Cartwright, and J. G. Younger. Multiple-compartment bacterial clearance kinetics during murine bacteremia. *J. Crit. Care*, 21(4):359–360, 2006.
- [57] J. G. Younger, K. A. Taylor, A. P. Thompson, and **D. M. Bortz**. Quantification and modeling of aggregate bacterial growth in suspension: Implications for Bacteremia. *Shock*, 25(Supp. 1):79–80, 2006.
- [58] I. Ben-David, S. E. Price, S. E. Cohen, **D. M. Bortz**, T. L. Jackson, and J. G. Younger. Complement C3 is necessary for early suppression of intrapulmonary bacterial growth. *Shock*, 23(Supp. 3):79–80, 2005.
- [59] A. L. Bauer, **D. M. Bortz**, D. Gammack, I. Ben-David, A. Stein, T. L. Jackson, and J. G. Younger. Virulence of Klebsiella pneumoniae predicted by nonlinear biodistributive mathematical model. *Shock*, 21(Supp. 2):29, 2004.

Non-Refereed Publications

- [60] I. Mirzaev and **D. M. Bortz**. Criteria for linearized stability for a size-structured population model. *arXiv:1502.02754*, Oct. 2015.
- [61] **D. M. Bortz** and A. J. Christlieb. Scandalously Parallelizable Mesh Generation. *arXiv:1103.5268*, Mar. 2011.
- [62] **D. M. Bortz**, A. D. Rubio, H. T. Banks, A. B. Cain, and R. C. Smith. Reduced order modeling in control of open cavity acoustics. Technical Report CRSC-TR00-18, Center for Research in Scientific Computation, North Carolina State University, Raleigh, NC, 2000.
- [63] **D. M. Bortz**, R. D. Guy, J. Hood, K. Kirkpatrick, and V. Nguyen. Modeling HIV Infection Dynamics using Delay Equations. In P. Gremaud, Z. Li, R. C. Smith, and H. T. Tran, editors, *Proceedings of the 2000 IMMW*, Raleigh, NC, 2000.
- [64] A. S. Bondarenko, **D. M. Bortz**, and J. J. Moré. COPS: Large-Scale Nonlinearly Constrained Optimization Problems. Technical Report ANL/MCS-TM-237, Argonne National Laboratory, Argonne, IL, 1998.
- [65] P. Barnes, **D. M. Bortz**, S. Frank, I. Loladze, E. Packard, and M. Santhanam. Power Transformer Clearance Checking. In F. Reitich, J. S. Scroggs, and H. T. Tran, editors, *Proceedings of the 1997 IMMW*, Raleigh, NC, 1998.

Funding

- 6/2018–5/2021 Co-PI: NSF Comp. & Comm. Foundations CCF-1815983 (PI: S. Sankaranarayanan)
Rigorous Synthesis and Verification of Decisions Using Data-Driven Models
CU-APPM portion: ~\$35,000 Total \$499,570
- 12/2017–6/2018 Consultant: HRL
Multi-Static Cognitive Radar Processor
- 7/2017–6/2021 PI: NSF/NIH Joint DMS/NIGMS Mathematical Biology Initiative R01GM126559
Epithelial Cell Migration: Model selection for mechanistic model development
CU-APPM portion: \$880,880 Total: \$1,540,000
- 1/2017–7/2017 PI: RASEI Seed Grant
The Impact of Carboxysome Age and Inheritance on Metabolic Heterogeneity in Populations of Photosynthetic Microbes
CU-APPM portion: \$17,819
- 4/2016–8/2017 Consultant: Leidos
- 4/2015–12/2015 Consultant: Exelis
- 10/2014–9/2017 Co-PI: NSF Cyber-Physical Systems CPS-1446900 (PI: S. Sankaranarayanan)
In-Silico Functional Verification of Artificial Pancreas Control Algorithms
CU-APPM portion: \$86,342 Total: \$615,404

8/2012–8/2017 PI: NSF Math Biology DMS-1225878

Microbial Flocculation Dynamics

CU portion: \$323,415 Total: \$485,866

1/2012–8/2015 Consultant: HRL/ONR N00014-12-C-0027

Ultra Wideband Cognitive Channelizer

10/2011–12/2015 Subcontract PI: NIH-NIGMS 5R01GM069438-07 (PI: J. Younger)

Complement C5a in Human Sepsis

CU portion: \$143,679 Total: \$1,666,662

9/2011–10/2013 Consultant: HRL/DARPA/AFRL FA8650-11-C-7158

Cognitive radio Low-energy signal Analysis Sensor ICs (CLASIC)

5/2011 PI: NVIDIA Academic Partner Grant (GPU equipment donation)

10/2009–9/2014 Co-PI: NSF CDI-Type II PHY-0940991 (PI: M. Solomon)

Flow-induced fragmentation mechanisms in bacterial biofilms by hierarchical modeling of polymeric, interfacial and viscoelastic interactions

CU portion: \$375,565 Total: \$1,924,018

12/2008–6/2011 PI: DOD-AFOSR FA9550-09-1-0404

Solving Differential Equations with Random Ultra-Sparse Numerical Discretizations

CU portion: \$95,960 Total: \$154,321

6/2009–4/2013 Subcontract PI: NIH-NIBIB 1R01GM081702-01A2 (PI: J. Younger)

Biomechanics of Bloodstream Infections

CU portion: \$385,440 Total: \$2,120,694

1/2009–1/2011 Subcontract PI: DOE-NREL KXEA-3-33606-41

Applied Mathematics Research for High Performance Systems Biology

CU portion: \$104,359

7/2005–6/2009 Subcontract PI: NIH-NIGMS 3R01GM069438-02S1 (PI: J. Younger)

C5a in defense against murine Gram-negative pneumonia

CU portion: \$75,000, Total: \$1,506,129

1/2006–12/2006 Co-PI: Univ. of Michigan: New Initiatives

Characterization of Bacterial Aggregates using Dynamic Light Scattering

(graduate student funding at U. Michigan)

Invited Presentations

2018: Math & Stat Challenges in Bridging Model Development, Parameter Identification and Model Selection in the Biological Sciences, Banff International Research Station, Banff, Canada
Workshop on Microbial Systems Modeling, Fields Institute: Toronto, Canada
U. Colorado-Boulder Mathematical Biology Seminar: Boulder, CO

2016: SIAM Conference on the Life Sciences: Boston, MA

- 2015:** 12th IFAC Workshop on Time Delay Systems: Ann Arbor, MI
- 2014:** Colorado School of Mines Mathematics & Statistics Colloquium: Golden, CO
SIAM Conference on the Life Sciences: Charlotte, NC
Michigan State Science at the Edge Seminar Series: East Lansing, MI
- 2013:** GPU Technology Conference: San Jose, CA (~ 30% acceptance rate)
- 2012:** DARPA MTO/CLASIC Program Review: Detroit, MI
U. Colorado-Boulder Computational Mathematics Seminar: Boulder, CO
SMB Annual Meeting: Knoxville, TN
S. Hills Middle School Career Day: Boulder, CO
- 2011:** Virginia Tech Mathematics Colloquium: Blacksburg, VA
Michigan State Applied Mathematics Seminar: East Lansing, MI
AFOSR Computational Math Program Review: Arlington, VA
DARPA MTO/CLASIC Kickoff Meeting: Arlington, VA
Int. Congress of Industrial & Applied Math.: Vancouver, Canada
Math Methods & Modeling in Life Sci. & Biomed.: Sile, Turkey
S. Hills Middle School Career Day: Boulder, CO
- 2010:** Purdue Applied Math Seminar: West Lafayette, IN
AFOSR Computational Math Program Review: Arlington, VA
NSF Soft Matter Workshop: Fort Collins, CO
SIAM Life Sciences: Pittsburgh, PA
ISBA: Benidorm, Spain
SIAM SE-Atlantic Section Conf.: Raleigh, NC
Purdue Grad Student Lunch Seminar: West Lafayette, IN
Michigan State Pi Mu Epsilon Induction Speaker: East Lansing, MI
- 2009:** U. Chicago Computation Institute Seminar: Chicago, IL
U. Wisconsin Applied Mathematics Seminar: Madison, WI
Arizona State Mathematical Biology Seminar: Tempe, AZ
Iowa State Applied Mathematics Seminar: Ames, IA
Colorado State Inverse Problems Seminar: Fort Collins, CO
U. Graz Applied Math: Graz, Austria
SIAM Annual Meeting: Denver, CO
Math Mod. & Ana. of Pop. in Bio. Sys.: Hunstville, AL
U. Graz Math Biology Summer School: Graz, Austria
U. Michigan Math Camp: Ann Arbor, MI
- 2008:** Penn State Pritchard Fluid Mechanics Seminar: University Park, PA
Colorado State Applied Mathematics Seminar: Fort Collins, CO
U. Colorado-Boulder Bioinformatics Seminar: Boulder, CO
U. Colorado-Boulder Dynamics Seminar: Boulder, CO
U. Colorado-Colorado Springs Joint Math and Biology Seminar: Colorado Springs, CO
U. Louisiana-Lafayette Lloyd Roeling Mathematics Conference: Lafayette, LA

Society for Engineering Science: Urbana, IL
SIAM Life Sciences Meeting: Montreal, Canada
SIAM Annual Meeting: San Diego, CA
SAMSI Meta-Analysis Workshop: RTP, NC
Inverse Problems in Math & Sci.: Fethiye, Turkey
Conf. on Math in the Life & Bio. Sciences: Raleigh, NC
Pikes Peak Regional Undergrad Math. Conf.: Colorado Springs, CO
U. Colorado-Boulder SIAM Student chapter: Boulder, CO
Nat. Renewable Energy Lab.: Golden, CO

2007: U. Colorado-Denver Center for AIDS Research: Denver, CO
Math Modeling & Comp. Methods in Sci. & Eng.: Kobe, Japan
Int. Conference on Complexity in Acute Illness: Long Beach, CA
Society for Mathematical Biology Annual Meeting: San Jose, CA
Int. Congress of Industrial & Applied Math.: Zurich, Switzerland
Conf. on Comp. & Math. Methods in Science & Engineering: Chicago, IL
Conf. on Math in the Life & Bio. Sciences: Blacksburg, VA
Young Investigator Workshop at MBI: Columbus, OH
Approx. Methods for Design & Control: Buenos Aires, Argentina
AMS Sectional Meeting: Tucson, AZ

2006: Washington State Mathematics Colloquium: Pullman, WA
U. Cincinnati Mathematics Colloquium: Cincinnati, OH
U. Michigan Mathematical Biology Seminar: Ann Arbor, MI
Clemson Mathematics & Statistics Colloquium: Clemson, SC
U. Pittsburgh Mathematics Colloquium: Pittsburgh, PA
Texas Tech Mathematics Colloquium: Lubbock, TX
Michigan State Applied Mathematics Seminar: East Lansing, MI
U. Wyoming Mathematics Colloquium: Laramie, WY
U. Rochester Biostatistics and Computational Biology Seminar: Rochester, NY
U. Colorado-Boulder Colloquium: Boulder, CO
U. Colorado-Boulder Dynamics Seminar: Boulder, CO
AMS Sectional Meeting: Cincinnati, OH
Int. Conference on Complexity in Acute Illness: Washington, DC
SIAM Life Sciences Meeting: Raleigh, NC
SIAM Annual Meeting: Boston, MA
Inv. Prob. in Modeling & Sim.: Fethiye, Turkey
MAA Michigan Section: Grand Rapids, MI
U. Michigan Mathematics Summer Scholars: Ann Arbor, MI

2005: U. Michigan Mathematical Biology Seminar: Ann Arbor, MI
Arizona State Mathematics & Statistics Colloquium: Tempe, AZ
Virginia Tech Mathematics Colloquium: Blacksburg, VA
U. Iowa Mathematics Colloquium: Iowa City, IA
Case Western University Mathematics Colloquium: Cleveland, OH
SIAM Annual Meeting: New Orleans, LA

- 2004:** U. Michigan Mathematical Biology Seminar: Ann Arbor, MI
Int. Conf. on Complexity in Acute Illness: Pittsburgh, PA
Michigan State Applied Mathematics Seminar: East Lansing, MI
Society for Mathematical Biology Annual Meeting: Ann Arbor, MI
SIAM Life Sciences Meeting: Portland, OR
Conference on Dyn. Sys. & Diff. Eqns.: Pomona, CA
- 2003:** Biocomplexity V: South Bend, IN
CCBS VIII: Bozeman, MT
IPAM Conf. on Applied Inverse Problems: Lake Arrowhead, CA
U. Michigan VIGRE Scientific Computing Seminar: Ann Arbor, MI
U. Michigan Mathematical Biology Seminar: Ann Arbor, MI
- 2002:** SIAM Life Sciences Meeting: Boston, MA
NCSU Grad Student Applied Math Seminar: Raleigh, NC
Mathematics and Molecular Biology VII: Santa Fe, NM
U. Pierre et Marie Curie Lab. d'Analyse Num.: Paris, France
Future Directions in Distributed Parameter Systems: Raleigh, NC
AIAA 2000: Maui, HI
NCSU Grad Student Numerical Analysis: Raleigh, NC

Mentoring

Postdoc Mentor

- Brendan Fry (informal), 2015-2016
currently: faculty at the Metropolitan State University at Denver
- Sarthok Sircar, 2012-2014
currently: faculty at the University of Adelaide
- Chris Curtis (informal), 2011-2013
currently: faculty at San Diego State University

Graduate Advisor - Applied Mathematics

- Sabina Altus, PhD, **NSF MSGI Award**
- Lewis Baker, PhD, **DOE CNLS GRA**
- Harry Dudley, PhD, **DOE Givens Associateship**
- Jacqueline Wentz, IQBio certificate, PhD, **NSF GRFP Award**
- Jay Stotsky, PhD 2018, **DOE CSGF Award**
currently: postdoctoral researcher at Minnesota
- John Nardini, IQBio certificate, PhD 2018, **NSF GRFP Honorable Mention**
currently: postdoctoral fellow at SAMSI
- Inom Mirzaev, PhD 2017
currently: postdoctoral fellow at MBI
- Dustin Keck, PhD 2014
currently: faculty at the Air Force Academy
- Stephen Kissler, MS 2014, **Gates-Cambridge Fellow**
currently: Gates Scholar at Cambridge in Applied Math

Jason Hammond, PhD 2012

currently: permanent researcher at AFRL-Kirtland AFB

Erin Byrne, PhD 2011

post-graduation: postdoc at Harvey Mudd, faculty at Olin College

currently: The Mathworks

Graduate Advisor - Computer Science

Taisa Kushner, IQBio certificate, PhD, **NSF GRFP Honorable Mention**

Committee Member

E.P. Kightley, Applied Math PhD

S. Shrestha, Applied Math PhD

Y. Chen, Applied Math PhD 2014

T. Galanthay, Applied Math PhD 2013

S. Orlofske, Ecol.&Evol. Bio. PhD 2013

D. O'Connor, Civil, Env.&Arch. Eng. PhD 2012

J. Mann, Civil, Env.&Arch. Eng. MS 2011

K. Snyder, Applied Math PhD 2011

J. Falk, Elec. Eng. MS 2009

T. Caldwell, Elec. Eng. MS 2009

A. Barker, Applied Math PhD 2009

D. Simpson, Applied Math PhD 2008

N. Aragon, Applied Math PhD 2008

W. Mao, Applied Math PhD 2007

IQBio Rotation Mentor

Ethan Hobbs, Fall 2018

Antony Pearson, Spring 2015

Vicky Li, Winter 2013/2014

David Brazel, Winter 2013/2014

Anna Broido, Fall 2012

Ryan Langendorf, Fall 2012

External PhD Examiner

Wang Jin, Mathematical Sciences, Queensland University of Technology, PhD 2017

Aurora Armiento, Mathematics, U. Paris Diderot, PhD 2016

Hedia Fgaier, Mathematics & Statistics, U. Guelph, PhD 2010

Undergrad Mentor

Sarah Stoeck, 2014-2015, **UROP Award**

Zachary Thoutt, 2014

Sam Hsu, 2012-2014, **UROP Award**

Noor Tell, 2012 SMART program

Victoria Gershuny, 2011-14, **UROP Award, DOD NDSEG Award**

post-graduation: graduate student at U. Arizona

Stephen Kissler, 2011-14, **Provost Award, Distinguished Senior Award**

post-graduation: graduate student at Cambridge University

Ben Noe, 2011-12, **UROP Award**

Martin Sotola, 2011-12, **UROP Award**

Dua Chaker, 2011, **Provost Award**

Toni Klopfenstein, 2009-10, **UROP Award**

Matanya Horowitz, 2009-10, **NSF GRFP Award**

post-graduation: graduate student at Cal Tech

Kami Wilson, 2008

post-graduation: graduate student at Northwestern

Anna Lieb, 2007-08, **Goldwater scholar, Churchill scholar, NSF GRFP Award**

post-graduation: graduate student at UC-Berkeley
Greg Carlson, 2007

Teaching

University of Colorado-Boulder

Differential Equations with Linear Algebra (APPM 2360)
Fourier Series and Boundary Value Problems (APPM 4350/5350)
Modeling in Math Biology (APPM 4390/5390)
Numerical Methods II (APPM 4660)
Mathematical Biology Seminar (APPM 8400)
Foundations of Quantitative Biology (PHYS 7810)
Module on Mathematical Epidemiology and Stochastic Modeling

University of Michigan-Ann Arbor

Honors Applied Calculus II (MATH 156)
Honors Applied Calculus IV (MATH 256)
Boundary Value Problems for PDEs (MATH 454)
Mathematical Modeling (MATH 462)
Mathematical Modeling in Biology (MATH 463)
Introduction to Numerical Methods (MATH 471)

North Carolina State University

Differential Equations I (MATH 341)

Service

Editorial Boards:

2012-pres. Associate Editor, Mathematical Biosciences & Engineering
2013-2016 Associate Editor, SIAM Undergraduate Research Online

Grant Reviews:

2014 NSF Mathematical Biology
2012 Army Research Office Biomathematics
Netherlands Organisation for Scientific Research (NWO)
2011 Louisiana Board of Regents
2009 Joint NSF/NIH Program (Applied Mathematics & Mathematical Biology - DMS/NIGMS)
2006 NSF Division of Environmental Biology

University of Colorado-Boulder Campus Service:

2011-pres. BioFrontiers Task Force Member
IQ Biology Faculty Member
2010-pres. IQ Biology Working Group
2009-pres. Renewable and Sustainable Energy Institute Affiliate
2014-pres. Boulder Campus Cyberinfrastructure Board
2013-2014 IQBiology Graduate Admissions
2012-2013 IQBiology Graduate Admissions

BioFrontiers Faculty Search Committee
2011-2012 IQBiology Graduate Admissions

University of Colorado-Boulder Applied Mathematics Department Service:

2009-pres. Developed APPM Mathematical Biology Group <http://mathbio.colorado.edu>

2018-2019 Faculty Search Committee (chair)

Chair's advisory committee

Multi-year hiring advisory committee

Preliminary Exam Committee for Numerical Analysis

Primary Unit Evaluation Committee

Post Tenure Review Committee

Award Committee

Professional Masters Degree Committee

2017-2018 Faculty Search Committee (chair)

Managed APPM Professional Masters Degree

Chair's advisory committee

Multi-year hiring advisory committee

Primary Unit Evaluation Committee

2016-2017 Created APPM Professional Masters Degree

Preliminary Exam Committee for Partial Differential Equations

2015-2016 Professional Masters Degree Committee (chair)

Hiring Plans Committee

Primary Unit Evaluation Committee

Faculty Search Committee

Graduate Committee

2014-2015 Professional Masters Degree Committee (chair)

Hiring Plans Committee

Academic Prioritization Committee

Faculty Search Committee

School of Mathematical Sciences Committee

2013-2014 Faculty Search Committee

Graduate Committee

Preliminary Exam Committee for Partial Differential Equations

2012-2013 Graduate Committee

Preliminary Exam Committee for Partial Differential Equations

2011-2012 Graduate Committee

Undergraduate Committee

2010-2011 Department Colloquium Committee (chair)

2009-2010 Created Mathematical Biology course APPM 4390/5390

http://mathbio.colorado.edu/index.php/APPM_4390/5390

Preliminary Exam Committee for Numerical Analysis

Undergraduate Committee

2008-2009 Faculty Search Committee

Undergraduate Committee

2007-2008 Undergraduate Committee

2006-2007 Faculty Search Committee

Scientific Meeting Minisymposium Organization:

- 2017 Society for Mathematical Biology Annual Meeting, Salt Lake City, UT
 - MS32: Stage-Structured Population Models in Biology
- 2016 SIAM Conference on the Life Sciences, Boston, MA
 - MS56: Microscale Cellular Modeling and Emergent Macroscale Growth Dynamics
- 2015 Society for Mathematical Biology Annual Meeting, Atlanta, GA
 - E3: Stability Analysis and Inverse Problem for Structured-population Dynamics
 - F4: Migration & Signalling Waves in Cellular Biology
 - I5: Advances in Models for Biological Aggregation & Fragmentation
 - K3: Modeling & Simulation of the Biomechanics of Heterogenous Biomaterials
- 2014 SIAM Conference on the Life Sciences, Charlotte, NC
 - MS8: Structured Population Dynamics: Modeling, Estimation, & Validation, Part I
 - MS16: Structured Population Dynamics: Modeling, Estimation, & Validation, Part II
- 2012 Society for Mathematical Biology Annual Meeting, Knoxville, TN
 - MS2: Modeling, simulation, & validation of the biomechanics of microbial communities
 - MS31: Experimental Design for Dynamical System Models in Biology
- 2011 International Council of Industrial and Applied Mathematics, Vancouver, BC, Canada
 - MS193: Scandalously Parallelizable Methods for ODE/PDE Simulations
- 2009 SIAM Annual Meeting, Denver, CO
 - MS3: Biofilm-Flow Interactions, Part I
 - MS10: Biofilm-Flow Interactions, Part II
 - MS71: Modeling of Large-Scale Metabolic Networks
- 2008 SIAM Conference on the Life Sciences, Montreal, QC, Canada
 - MS9: Biofilms: Fragmentation & Control, Part II
- 2007 International Council of Industrial and Applied Mathematics, Zurich, Switzerland
 - IC/MP928/025: New directions in PDE simulations
- 2004 Society for Mathematical Biology Annual Meeting, Ann Arbor, MI
 - MS4: Dynamical System Modeling of Gene Expression & Regulatory Dynamics
- 2003 SIAM Annual Meeting, Montreal, QC, Canada
 - MS48: Applications of Delay Differential Equations to Mathematical Biology
- 2002 SIAM Conference on the Life Sciences, Boston, MA
 - MS14: Modeling & Control in HIV

Scientific Reviewing:

American Journal of Physiology: Endocrinology and Metabolism	Journal of Nonlinear Analysis B
Applied Mathematical Modeling	Journal of Numerical Mathematics: Theory, Methods and Applications
Ars Combinatoria	Journal of the Royal Society Interface
Bulletin of Mathematical Biology	Journal of Theoretical Biology
Chaos	Mathematical Biosciences
Communications in Computational Physics	Mathematical Biosciences and Engineering
Computer Aided Verification	Mathematics and Computers in Simulation
Computers and Mathematics with Applications	Numerical Functional Analysis and Optimization
Dynamical Systems and Applications	Neural Computing and Applications
European Journal of Applied Mathematics	Optimization and Engineering
IEEE Trans. Biomedical Engineering	Physica A
International Journal of Mathematics	Physica D
Inverse Problems in Science and Engineering	Physics Letters A
Journal of Applied Physics	PLoS: Computational Biology
Journal of Biological Dynamics	PLoS: Medicine
Journal of Critical Care	PLoS: ONE
Journal of General Virology	Quarterly of Applied Mathematics
Journal of Inverse and Ill-Posed Problems	SIAM Book Proposals
Journal of Mathematical Analysis and Applications	SIAM Journal on Applied Mathematics
Journal of Mathematical Biology	Theoretical Biology and Medical Modelling