Mark Alber

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Fields: Applied Mathematics; Mathematical and Computational Biology; Multi-scale Modeling of Blood Clotting, Bacterial Biofilms and Swarming and Early Development; Mathematical Physics

Education:

1990 -	Ph.D. in Mathematics, *University of Pennsylvania, Philadelphia, PA* advisor: J.E. Marsden, Caltech
1983 -	Honors M.S. in Applied Mathematics, *Department of Applied Mathematics*, *Moscow Institute of Technology*

Positions Held:

2016 - present	Distinguished Professor, Department of Mathematics, University of California, Riverside (UCR)
2017 - present	Director, Center for Quantitative Modeling in Biology, UCR
2020 - present	Member of the Committee on Academic Personnel, UCR
2019 - present	Member of the Advisery Board of the UCR Center for Robotics and Intellegent Systems
2017 - present	Cooperating Faculty, Department of Internal Medicine, Division of Clinical Sciences, School of Medicine, UCR
2017 - present	Cooperating Faculty, Department of Bioengineering, UCR
2017 - present	Member of the Institute for Integrative Genome Biology, UCR
2017-2019	Member of the Steering Committee of the US Interagency Modeling and Analysis Group (IMAG): https://www.imagwiki.nibib.nih.gov/
2017 - 2019	Member of the Faculty Advisory Board to the Office of Research and Economic Development, UCR
2017 - present	Member of the UCR Bioengineering Interdepartmental Graduate Program
2010 - present	Adjunct Professor of Medicine, Indiana University School of Medicine
2009 - 2016	Vincent J. Duncan Family Professor of Applied Mathematics, University of Notre Dame (UND)
2011 - 2015	Director of Graduate Studies, ACMS Department, University of Notre Dame
2003 - 2016	Director, Interdisciplinary Center for the Study of Biocomplexity
2003 - 2016	Concurrent Professor of Physics, UND
2011 - 2016	Concurrent Professor of Computer Science and Engineering, UND
2012 - 2016	Program Co-Leader of the Computational Modeling, Drug Development and Delivery (CoMD3) Program, Harper Cancer Research Institute, IU School of Medicine and University of Notre Dame
2006 - 2009	Notre Dame University Professor of Applied Mathematics
2001 - 2006	Full Professor of Mathematics, University of Notre Dame

1996 - 2001	Tenured Associate Professor, University of Notre Dame
2000 - 2001	On Sabbatical leave at Stanford University, CA
March-June 2001	Senior Fellow, Institute for Pure and Applied Mathematics, UCLA, CA
October 2000	Institute for Mathematics and its Applications (IMA), Minneapolis
1990 - 1996	Tenure Track Assistant Professor, University of Notre Dame
Summer 1995, 1996	Basic Research Institute in the Mathematical Sciences (BRIMS) Hewlett-Packard Research Lab., Bristol, UK
Summer 1994	CNLS, Los Alamos Natl. Lab., NM
1993 - 1994	On Sabbatical leave at UC Berkeley, CA; Institute for Advanced Study, Princeton, NJ; Mathematical Sciences Research Institute, Berkeley, CA
June 1993	The Fields Institute for Research in Mathematical Sciences, Canada
Summer 1990	Instructor, University of Pennsylvania

Honors and Service:

2023-24	Fulbright US Scholar Award, The Netherlands
2011	Elected Fellow, American Association for the Advancement of Science (AAAS)
2023	UC Riverside Outstanding Global Ambassador Award
2016 - present	Distinguished Professor, Department of Mathematics, UC Riverside
2022 -	2022 Distinguished Colloquium Lecture, San Diego State University
2019 -	2019 Honorary Guest Kloosterman Chair at the Mathematical Institute, Leiden Univ The Netherlands
2009 - 2016	Vincent J. Duncan Family Professor of Applied Mathematics
2006 - 2009	Notre Dame Endowed University Professor of Applied Mathematics
2016	Keynote Speaker, 8th International Bio-fluid Mechanics Symposia, Caltech
2013	Distinguished Lecture in Applied Mathematics, U of Massachusets, Amherst
2022 - present	Section Editor, PLoS Computational Biology
2013 - 2022	Deputy Editor, PLoS Computational Biology
2010 - present	Associate Editor, Bulletin of Mathematical Biology
2022 - present	Associate Editor, Frontiers in Physiology, section on Computational Physiology and Medicine
2010 - present	Member of the Editorial Board, Biophysical Journal
2018-2020	Member of the Steering Committee of the NIH Multiscale Modeling Consortium
2011 - 2013	Associate Editor, PLoS Computational Biology
2008 - 2012	Member of the Editorial Board, Journal of Statistical Physics
2018-19	Member of the NSF-NIH Mathematical Biology Panel, NIH Modeling and Analysis of Biological Systems (MABS) Study Section, National Institute of Biomedical Imaging and Bioengineering Special Emphasis Panel ZEB1 OSR-C (M1) MSM Program Review as well as The Paul G. Allen Frontiers Group Panel
2017	Member of the IRNIA Computational Biology Review Panel (Paris, France)
2010-2017	Member of 5 NSF Panels and 12 NIH panels including 2017 NSF CAREER Review Panel, 2017 NSF National Scientific Centers Review Panel 2017 NIH National Institute of Biomedical Imaging and Bioengineering Special Emphasis Panel ZEB1 OSR-C (J2) MSM Program Review Panel (two times), Modeling and Analysis of Biological Systems (MABS) Study Section,

	Special Emphasis Panel ZRG1 IMSTJ 40, SBIR/STTR Study Section IMST-K(14)B Special Emphasis Panel ZRG1 BST-N (51), 2014 Big Data Panels at NIH and NSF.
2009 - 2015	Field Editor for Applications in Biosciences and Medicine of the Encyclopedia of Applied and Computational Mathematics (Springer)
2010-2016	Member of the Committee of the American Mathematical Society on Human Rights of Mathematicians
2013 - 2016	Representative of the American Mathematical Society to the AAAS Human Rights Coalition (HRC) and member of the Council of the HRC
2001, 2004, 2008	Member of NSF and NIH Panels

Publications:

***Edited Special Issues of Journals and Books*:**

1. Special Issue on "Mathematical Modeling and Biophysical Characterization of Thrombosis", Mark Alber, Aaron Fogelson and Katie Link, Editors, Biomechanics and Mechanobiology section, Current Opinion in Biomedical Engineering, Volume 22, June 2022, 100369.
2. Special Issue on "Multi-scale Modeling of Tissue Growth and Shape", Bulletin of Mathematical Biology, Mark Alber, Christophe Godin, Philip Maini, Roeland Merks, Eric Mjolsness, Editors, Volume 81, Issue 8 (2019).
3. Mark Alber, Editor for the Section on Mathematical and Computational Methods in Biosciences and Medicine of the Encyclopedia of Applied and Computational Mathematics, *Springer*, 2016, 1676 p. In 2 volumes.
4. Special Issue of the Bulletin of Mathematical Biology, "Biomedical Modeling", M.Alber, P.Maini, G. Niebur, Editors, Volume 75, Issue 8, August 2013. ISSN: 0092-8240.
5. Special Issue on Applications to Biology of the Journal of Statistical Physics, Mark Alber, Ray Goldstein, Erwin Frey, Editors, *Springer*, Volume 128, Issue 1-2, July 2007.
6. Special Issue on Multiscale Modeling in Biology, SIAM Journal: Multiscale Modeling and Simulation, Mark Alber, Thomas Hou, James A. Glazier, Yi Jiang, Editors, *SIAM*, Volume 3, Number 2, 2005.
7. Special Issue of the Journal: Biofilms, Clay Fuqua, James A. Glazier, Yves Brun and Mark S. Alber, Editors, *Cambridge University Press*, Volume 1, Number 4, 2004.
8. Alber, M.S. , B. Hu and J. Rosenthal, Editors, Current and future directions in applied mathematics [1997]. Papers from the symposium held at the University of Notre Dame, Notre Dame, IN, April 1996. *Birkhouser Boston, Inc., Boston, MA* x+261.

Papers in Peer-reviewed Journals:

9. Kevin Tsai, Zhen Zhou, Jiadong Yang, Zhiliang Xu, Shixin Xu, Roya Zandi, Nan Hao, Weitao Chen, Mark Alber [2024], Study of impacts of two types of cellular aging on the yeast bud morphogenesis. *PLoS Comput Biol* 20(9): e1012491. https://doi.

org/10.1371/journal.pcbi.1012491.

10. Nilay Kumar, Jennifer Rangel Ambriz, Kevin Tsai, Mayesha Sahir Mim, Marycruz Flores-Flores, Weitao Chen, Jeremiah J. Zartman and Mark Alber [2024], Balancing competing effects of tissue growth and cytoskeletal regulation during Drosophila wing disc development, *Nature Communications*, volume 15, Article number: 2477. https://doi.org/10.1038/s41467-024-46698-7
11. Cannon, W. R., Britton, S., Banwarth-Kuhn, M., Alber, M. [2024], Probabilistic and maximum entropy modeling of chemical reaction systems: Characteristics and comparisons to mass action kinetic models. *The Journal of Chemical Physics*, 160(21). https://doi.org/10.1063/5.0180417
12. Christian Michael, Francesco Pancaldi, Samuel Britton, Oleg V. Kim, Alina D. Peshkova, Khoi Vo, Zhiliang Xu, Rustem I. Litvinov, John W. Weisel, Mark Alber [2023], Combined computational modeling and experimental study of the biomechanical mechanisms of platelet-driven contraction of fibrin clots, *Communications Biology* 6, 869. https://doi.org/10.1038/s42003-023-05240-z
13. Christian Michael, Mikahl Banwarth-Kuhn, Kevin Rodriguez, Calvin-Khang Ta, Amit Roy-Chowdhury, Weitao Chen, G. Venugopala Reddy and Mark Alber [2023], Role of turgor-pressure induced boundary tension in the maintenance of the shoot apical meristem of Arabidopsis thaliana. *J. R. Soc. Interface* 20: 20230173. https://doi.org/10.1098/rsif.2023.0173
14. Alireza Ramezani, Samuel Britton, Roya Zandi, Mark Alber, Ali Nematbakhsh and Weitao Chen [2023]. A multiscale chemical-mechanical model predicts impact of morphogen spreading on tissue growth. *npj Syst Biol Appl* 9, 16. https://doi.org/10.1038/s41540-023-00278-5
15. Mikahl Banwarth-Kuhn, Kevin Rodriguez, Christian Michael, Calvin-Khang Ta, Alexander Plong, Eric Bourgain-Chang, Ali Nematbakhsh, Weitao Chen, Amit Roy-Chowdhury, G. Venugopala Reddy and Mark Alber [2022], Combined computational modeling and experimental analysis integrating chemical and mechanical signals suggests possible mechanism of shoot meristem maintenance, *PLOS Computational Biology* 18(6): e1010199. https://doi.org/10.1371/journal.pcbi.1010199
16. Kevin Rodriguez, Albert Do, Betul Senay-Aras, Mariano Perales, Mark Alber, Weitao Chen, G. Venugopala Reddy [2022], Concentration-dependent transcriptional switching through a collective action of cis-elements, *Science Advances*, 10 Aug 2022 Vol 8, Issue 32, DOI: 10.1126/sciadv.abo6157
17. Shant M. Mahserejian, Jared P. Scripture, Ava J. Mauro, Elizabeth J. Lawrence, Erin M. Jonasson, Kristopher S. Murray, Jun Li, Melissa Gardner, Mark Alber, Marija Zanic, Holly V. Goodson [2022], Quantification of Microtubule Stutters: Dynamic Instability Behaviors that are Strongly Associated with Catastrophe, *Molecular Biology of the Cell*, Mar 1;33(3): doi: 10.1091/mbc.E20-06-0348.
18. Pancaldi, F.; Kim, O.V.; Weisel, J.W.; Alber, M.; Xu, Z. [2022], Computational Biomechanical Modeling of Fibrin Networks and Platelet Fiber Network Interactions. *Curr. Opin. Biomed. Eng.* 22, 100369
19. Alexander Plong, Kevin Rodriguez, Mark Alber, Weitao Chen, G. Venugopala Reddy

[2021], CLAVATA3 mediated simultaneous control of transcriptional and post-translational processes provides robustness to the WUSCHEL gradient, *Nature Communications* 12:6361.

20. Noelia Grande Gutierrez, Mark Alber, Andrew M. Kahn, Jane C. Burns, Mathew Mathew, Brian W. McCrindle, Alison L. Marsden [2021], Computational modeling of blood component transport related to coronary artery thrombosis in Kawasaki disease, *PLoS Computational Biology* 17(9): e1009331.
21. Ali Nematbakhsh, Megan Levis, Nilay Kumar, Weitao Chen, Jeremiah Zartman and Mark Albre [2020], Epithelial organ shape is generated by patterned actomyosin contractility and maintained by the extracellular matrix, *PLoS Computational Biology*, 16(8): e1008105. https://doi.org/10.1371/journal.pcbi.1008105
22. Kevin Tsai, Samuel Britton, Ali Nematbakhsh, Roya Zandi, Weitao Chen and Mark Alber [2020], Role of combined cell membrane and wall mechanical properties regulated by polarity signals in cell budding, *Physical Biology*,17(6), 065011.
23. Samuel Britton, Mark Alber and William R. Cannon [2020], Enzyme Activities Predicted by Metabolite Concentrations and Solvent Capacity in the Cell, *Journal of the Royal Society Interface* 17(171), 20200656.
24. Erin M. Jonasson, Ava J. Mauro, Chunlei Li, Ellen C. Labuz, Shant M. Mahserejian, Jared P. Scripture, Ivan V. Gregoretti, Mark Alber, and Holly V. Goodson [2020], Behaviors of individual microtubules and microtubule populations relative to critical concentrations: dynamic instability occurs when critical concentrations are driven apart by nucleotide hydrolysis, *Molecular Biology of the Cell* Vol. 31, No. 7, 589-618.
25. Grace C. Y. Peng, Mark Alber, Adrian Buganza Tepole, William R. Cannon, Suvranu De, Salvador Dura-Bernal, Krishna Garikipati, George Karniadakis, William W. Lytton, Paris Perdikaris, Linda Petzold & Ellen Kuhl [2021], Multiscale Modeling Meets Machine Learning: What Can We Learn? *Archives of Computational Methods in Engineering*, 28, pages1017–1037
26. Mark Alber, Adrian Buganza Tepole, William R. Cannon, Suvranu De, Salvador Dura-Bernal, Krishna Garikipati, George Karniadakis, William W. Lytton, Paris Perdikaris, Linda Petzold & Ellen Kuhl [2019], Integrating machine learning and multiscale modeling - perspectives, challenges, and opportunities in the biological, biomedical, and behavioral sciences, *npj Digital Medicine*, 2:115.
27. Samuel Britton, Oleg Kim, Francesco Pancaldi, Zhiliang Xu, Rustem I. Litvinov, John W. Weisel, Mark Alber [2019], Contribution of nascent cohesive fiber-fiber interactions to the non-linear elasticity of fibrin networks under tensile load, *Acta Biomaterialia* 94, 514-523.
28. Kim OV., Nevzorova TA., Mordakhanova ER., Ponomareva AA., Andrianova IA., Le Minh G., Daminova AG., Peshkova AD., Alber MS., Vagin O., Litvinov RI., Weisel JW., Fatal dysfunction and disintegration of thrombin-stimulated platelets. *Haematologica*. 2019 Feb 21. pii: haematol.2018.202309. doi: 10.3324/haematol.2018.202309. [Epub ahead of print]
29. Shixin Xu, Mark Alber and Zhiliang Xu [2019], Three-phase Model of Visco-elastic Incompressible Fluid Flow and its Computational Implementation, *Communications*

in Computational Physics 25(2):586-624.

30. Banwarth-Kuhn M., Nematbakhsh A., Rodriguez KW., Snipes S., Rasmussen CG., Reddy GV., Alber M. [2018], Cell-Based Model of the Generation and Maintenance of the Shape and Structure of the Multilayered Shoot Apical Meristem of Arabidopsis thaliana. *Bull. Math. Biol.* 2018 Dec 14. doi: 10.1007/s11538-018-00547-z. [Epub ahead of print]

31. Shixin Xu, Zhiliang Xu, Oleg Kim, Rustem I. Litvinov, John W. Weisel and Mark Alber [2017], Model Predictions of Deformation, Embolization, and Permeability of Partially Obstructive Blood Clots under Variable Shear Flow, *Journal of the Royal Society Interface* 14: 20170441. http://dx.doi.org/10.1098/rsif.2017.0441

32. Oleg V. Kim, Rustem I. Litvinov, Mark S. Alber and John W. Weisel [2017], Quantitative Structural Mechanobiology of Platelet-Driven Blood Clot Contraction, *Nature Communications* 8: 1274. https://www.nature.com/articles/s41467-017-00885-x.pdf (authors for correspondence: J.W. Weisel and M. Alber).

33. Peter Höök, Rustem I. Litvinov, Oleg V. Kim, Shixin Xu, Zhiliang Xu, Joel S. Bennett, Mark S. Alber and John W. Weisel [2017], Strong Binding of Platelet Integrin $\alpha IIb\beta$ to Fibrin Clots: Potential Target to Destabilize Thrombi, *Scientific Reports* 7: 13001 (published by Nature) DOI:10.1038/s41598-017-12615-w

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35. Peter Hook, Teresa Brito-Robinson, Oleg Kim, Cofy, Narciso, Holly V. Goodson, John W. Weisel, Mark S. Alber and Jeremiah J. Zartman, Whole Blood Clot Optical Clearing for Nondestructive 3D Imaging and Quatitative Analysis, *Biomedical Optics Express*, Volume 8, Issue 8, Page 3671. (authors for correspondence: J.Zartman, J.W. Weisel and M. Alber).

36. Ali Nematbakhsh, Wenzhao Sun, Pavel A. Brodskiy, Aboutaleb Amiri, Cody Narciso, Zhiliang Xu, Jeremiah J. Zartman, Mark Alber [2017], Multi-scale computational study of the mechanical regulation of cell mitotic rounding in epithelia, *PLoS Computational Biology*, 13(5): e1005533. https://doi.org/10.1371/journal.pcbi.1005533

37. Aranda R. Duan, Erin M. Jonasson, Emily O. Alberico, Chunlei Li, Jared P. Scripture, Rachel A. Miller, Mark S. Alber and Holly V. Goodson [2017], Interactions between Tau and different conformations of tubulin: Implications for Tau function and mechanism, *Journal of Molecular Biology* 429(9):1424-1438. doi: 10.1016/j.jmb.2017.03.018.

38. O.V. Kim, R.I. Litvinov, J. Chen, D.Z. Chen, J.W. Weisel and M.S. Alber [2017], Compression-induced structural and mechanical changes of fibrin-collagen composites, *Matrix Biol.* 2017 Jul;60-61:141-156. doi: 10.1016/j.matbio.2016.10.007. Epub 2016 Oct 15.

39. Aboutaleb Amiri, Cameron Harvey, Amy Buchmann, Scott Christley, Joshua D. Shrout, Igor S. Aranson, Mark Alber [2017], Reversals and collisions optimize protein exchange in bacterial swarms, *Physical Review E* 95, 032408.

40. Martina Bukač and Mark Alber[2017], Multi-component model of intramural hematoma, *Journal of Biomechanics* 50, 42–49.

41. Kim O, Liang X, Litvinov RI, Weisel JW, Alber MS, Purohit PK. [2016], Foam-like compression behavior of fibrin networks, *Biomech Model Mechanobiol.* 15:213–228.

42. Chen, J., M.S. Alber, and D.Z. Chen, A Hybrid Approach for Segmentation and Tracking of Myxococcus xanthus Swarms [2016], *IEEE Transactions on Medical Imaging* 35(9):2074-84.

43. Giordano Tierra, Juan P. Pavissich, Robert Nerenberg, Zhiliang Xu and Mark S. Alber [2015], Multicomponent model of deformation and detachment of a biofilm under fluid flow, *J. R. Soc. Interface* 12: 20150045.

44. Morales-Soto, N., Anyan, M. E., Mattingly, A. E., Madukoma, C. S., Harvey, C. W., Alber, M., Déziel, E., Kearns, D. B., and J.D. Shrout [2015], Preparation, Imaging, and Quantification of Bacterial Surface Motility Assays. *Journal of Visualized Experiments*, (98), e52338, doi:10.3791/52338.

45. Morgen E. Anyan, Aboutaleb Amiri, Cameron W. Harvey, Giordano Tierra, Nydia Morales-Soto, Callan M. Driscoll, Mark S. Alber, Joshua D. Shrout [2014], Type IV Pili Interactions Promote Intercellular Association and Moderate Swarming of Pseudomonas aeruginosa, *Proc. Natl. Acad. Sci. USA* vol. 111, no. 50, 18013—18018 (authors for correspondence: J. Shrout and M. Alber).

46. Wu Z, Xu Z, Kim O, Alber M. [2014], Three-dimensional multi-scale model of deformable platelets adhesion to vessel wall in blood flow. *Philosophical Transactions of the Royal Society A* 372: 20130380.

47. Chunlei Li, Jun Li, Holly V. Goodson and Mark S Alber [2014], Microtubule Dynamics Instability: the Role of Cracks between Protofilaments, *Soft Matter* 10, 2069-2080.

48. Amy Buchmann, Mark Alber and Jeremiah J. Zartman [2014], The mechanical feedback hypothesis of organ growth regulation, Modelling developmental signalling, *Seminars in Cell and Developmental Biology* 35, 73–81.

49. J. Chen, C.W. Harvey, M.S. Alber, and D.Z. Chen [2014], A Matching Model Based on Earth Mover's Distance for Tracking Myxococcus xanthus, *Med Image Comput Comput Assist Interv.* 17(Pt 2):113-20.

50. Oleg Kim, John McMurdy, Gregory Jay, Collin Lines, Gregory Crawford, and Mark Alber [2014], Combined Refflectance Spectroscopy and Stochastic Modeling Approach for Noninvasive Hemoglobin Determination via Palpebral Conjunctiva, *Physiological Reports*, Vol. 2, 1, e00192.

51. Oleg V. Kim, Rustem I. Litvinov, John W. Weisel and Mark S. Alber [2014], Structural basis for the nonlinear mechanics of fibrin networks under compression, *Biomaterials* 35, 6739–6749.

52. Cameron W. Harvey, Chinedu S. Madukoma, Shant Mahserejian, Mark S. Alber and Joshua D. Shrout [2014], Cell Division Resets Polarity and Motility for the Bacterium Myxococcus xanthus, *Journal of Bacteriology* 196, 22, 3853-3861.

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destabilizer Op18/stathmin, *Proc. Natl. Acad. Sci. USA*, 2013 Dec 17;110(51):20449-54. doi: 10.1073/pnas.1309958110.

54. Oleg V. Kim, Zhiliang Xu, Elliot D. Rosen and Mark S. Alber [2013], Fibrin Networks Regulate Protein Transport during Thrombus Development, *PLoS Computational Biology* 9 (6), e1003095.
55. Cameron Harvey, Mark Alber, Lev Tsimring, Igor Aronson [2013], Continuum modeling of clustering of myxobacteria, *New Journal of Physics* 15, 035029.
56. Yong-Tao Zhang, Mark S. Alber and Stuart A. Newman [2013], Mathematical Modeling of Vertebrate Limb Development, *Mathematical Biosciences* 243, 1–17 (one of 5 most downloaded papers in 2013).
57. Cameron W Harvey, Huijing Du, Zhiliang Xu, Dale Kaiser, Igor Aranson, Mark Alber [2012], Interconnected Cavernous Structure of Bacterial Fruiting Bodies, *PLoS Computational Biology* 8 (12), e1002850.
58. Constance L. Slaboch, Mark S. Alber, Elliot D. Rosen, Timothy C. Ovaert [2012], Mechano-rheological properties of the murine thrombus determined via nanoindentation and finite element modeling, *Journal of the Mechanical Behavior of Biomedical Materials* 10, 75–86.
59. Huijing Du, Zhiliang Xu, Morgen Anyan, Oleg Kim, W. Matthew Leevy, Joshua D. Shrout and Mark Alber [2012], High density waves of the bacterium Pseudomonas aeruginosa in propagating swarms result in efficient colonization of surfaces, *Biophysical Journal* 103(3), 601-609.
60. Richard Gejji, Pavel Lushnikov and Mark Alber [2012], Macroscopic model of self-propelled bacteria swarming with regular reversals, *Physical Review E* 85, 021903 (highlighted in Faculty of 1000).
61. Richard Gejji, Bogdan Kazmierczak and Mark Alber [2012], Classification and Stability of Global Inhomogeneous Solutions of a Macroscopic Model of Cell Motion, *Mathematical Biosciences*, 238(1) 21–31.
62. Gennady Margolin, Ivan V. Gregoretti, Trevor M. Ciskovski, Chunlei Li, Wei Shi, Mark S. Alber and Holly V. Goodson [2012], The Mechanisms of Microtubule Catastrophe and Rescue: Implications from analysis of a dimer-scale computational model, *Molecular Biology of the Cell*, 23:4 642–656 (highlighted in Faculty of 1000).
63. Oleg Kim, John McMurdy, Collin Lines, Susan Duffy, Gregory Crawford and Mark Alber [2012], Reflectance spectrometry of normal and bruised human skins: Experiments and modeling, *Physiological Measurement* 33, 159-175.
64. Zhiliang Xu, Oleg Kim, Malgorzata Kamocka, Elliot Rosen and Mark Alber, Multiscale Models of Thrombogenesis [2012], *Wiley Interdiscip Rev Syst Biol Med.* 4(3):237-46.
65. Christopher R. Sweet, Santanu Chatterjee, Zhiliang Xu,Katharine Bisordi, Elliot D. Rosen and Mark Alber [2011], Modeling Platelet-Blood Flow Interaction Using Subcellular Element Langevin Method, *Journal of the Royal Society Interface* 8 (65), 1760-71.
66. Yilin Wu, Yi Jiang, A. Dale Kaiser, Mark Alber [2011], Self-organization in bacterial

swarming: Lessons from Myxobacteria, *Physical Biology* 8 (5), 055003.

67. Huijing Du, Zhiliang Xu, Joshua D. Shrout and Mark Alber [2011], Multiscale Modeling of Pseudomonas aeruginosa Swarming, *Mathematical Models and Methods in Applied Sciences*, Vol. 21, Suppl. 939-954.
68. Cameron W. Harvey, Faruck Morcos, Christopher R. Sweet, Dale Kaiser, Santanu Chatterjee, Xiaomin Lu, Danny Chen and Mark Alber [2011], Study of elastic collisions of M. xanthus in swarms, *Physical Biology* 8, 026016.
69. Eungjun Kim, Oleg V. Kim, Kellie R. Machlus, Xiaomin Liu,Timur Kupaev,a Joshua Lioi, Alisa S.Wolberg, Danny Z. Chen, Elliot D. Rosen, Zhiliang Xu, and Mark Alber [2011], Correlation between fibrin network structure and mechanical properties: an experimental and computational analysis, *Soft Matter* 7, 4983.
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71. Xu, Z., M.M. Kamocka, M.S. Alber, and E.D. Rosen [2011], Computational Approaches to Studying Thrombus Development, *Arterioscler Thromb Vasc Biol* 31, 500-505.
72. Jianfeng Zhu, Yong-Tao Zhang, Mark S. Alber and Stuart A. Newman [2010], Bare bones pattern formation: a core regulatory network in varying geometries reproduces major features of vertebrate limb development and evolution, *PLoS ONE* (5): e10892.
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84. Lushnikov, P.P., Chen, N., and M.S. Alber [2008], Macroscopic dynamics of biological cells interacting via chemotaxis and direct contact, *Phys. Rev. E.* **78**, 061904 (highlighted in the Faculty of 1000 Biology).

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Results obtained by the Alber's group were featured in the following newspaper articles and reviews:

"UC Riverside math researchers find key to stopping ovarian cancer from spreading" By MARK MUCKENFUSS — mmuckenfuss@scng.com — The Press-Enterprise PUBLISHED: August 9, 2017 at 6:01 am — UPDATED: August 13, 2017 at 1:34 pm
http://www.pe.com/2017/08/09/ucr-math-researchers-find-key-to-stopping-ovarian-cancer-from-spreading/

Group's results on contraction of blood clots were featured on the front page of the NSF and by the NSF news.

"Researchers Look Inside Dangerous Blood Clots with Optical Clearing Technique", Press Release by the Optical Society of America, 17 July 2017

"How blood clots shrink", Microscopy and Analysis, Editorial, November 10, 2017:
https://microscopy-analysis.com/editorials/editorial-listings/how-blood-clots-shrink

'Reversing helps bacterial swarms to spread' by Heidi Ledford, Nature News, January 20th, 2009, doi:10.1038/news.2009.43:
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July 1, 2013 cover story in The Scientist mentions Alber group's results on social behav-

ior of Myxococcus xanthus and includes an interview with the former student Yilin Wu: http://www.the-scientist.com/?articles.view/articleNo/36101/title/Crowd-Control/

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Group's results on modeling bacterial collective motion were reviewed in: Tamas Vicsek and Anna Zafeiris, Collective motion, *Physics Reports* 517 (2012) 71-140.

Optical Coherence Tomography News featured the groups' paper on collaborative project with Argonne National laboratory "Cameron W Harvey, Huijing Du, Zhiliang Xu, Dale Kaiser, Igor Aranson, Mark Alber [2012], Interconnected Cavernous Structure of Bacterial Fruiting Bodies, PLoS Computational Biology 8 (12), e1002850": http://www.octnews.org/ http://www.octnews.org/articles/4355516/feature-of-the-week-2-17-13-using-optical-coherenc/

Partial List of Research Support:

NSF grant DMS 2424826, Collaborative Research: eMB: Data-driven mechano-chemical models of morphogenesis on deforming domains, $438,085, Multi-PI, PIs: Alber (UCR), Zartman (UN), Co-PIs: Chen, Xu, Dowling 08/01/2024-07/31/2027. This project will focus on investigating a critical late-stage phase of fruit fly wing disc development, called eversion, which undergoes a significant shape change and serves as a model of epithelial remodeling. These same mechanisms are also involved in the development, wound healing and cancer progression. Subsequent morphogenetic processes fully define the adult wing, hinge, and notum to generate the final adult organ structures. Individual cell shape changes lead to extensive tissue deformations during eversion. The proposed study combining modeling and experimentation will provide mechanistic insights into how hormonal signaling, morphogen-driven pattern formation, and cytoskeletal regulators synergistically impact epithelial organ architecture.

NSF grant DMS 2029814, MODULUS: Integrative multiscale modeling and multimodal experiments to decode systems-level molecular mechanisms of epithelial systems, 08/15/2020-07/31/2023, $899,916.00, PI: Alber. This project seeks to combine mathematical modeling and experimentation to bridge the critical knowledge gaps required to predict how molecular signaling controlled by morphogens such as the Bone Morphogenetic Protein (BMP) and Wingless/WNT signaling pathways through cytoskeletal regulators drives cell and tissue shape generation and maintenance during embryo development. Members of the team will integrate breakthroughs in mathematical theory of reaction-diffusion PDE systems on extending and deforming manifolds coupled with coarse graining mechanistic modeling approaches describing cell membrane and cytoskeleton with machine learning based

surrogate models for image analysis, parameter estimation and uncertainty analysis. Outreach activities of the project will be coordinated with the UCR Interdisciplinary Center for Quantitative Modeling in Biology (ICQMB: https://icqmb.ucr.edu/).

NSF grant DMS 1762063, Joint NSF DMS/NIH NIGMS Initiative to Support Research at the Interface of the Biological and Mathematical Sciences, Combined Modeling and Experimental Study of the Mechanisms of Growth Patterns in Stem Cell Homeostasis in Plants. 7/1/2018-6/30/23, $1,100,000, PI: Alber. This interdisciplinary research program aims to understand how mechanical connections among cells and chemical signals between them collaborate to control the growth, sell-organization and differentiation of stem cells during plant growth. Mathematical and computer models will allow researchers to perform virtual experiments that are currently impossible in the lab. Coupled with live imaging experiments and new image analysis methods, these experiments will yield insights into biological mechanisms governing organ formation in plants and animals and development of cancer in epithelial cell layers of the colon. UC Riverside is a Hispanic-serving institution with very diverse student population and with many students being first in their families to attend college.

DOE/PNNL (Award No. 492290), Elucidating Principles of Bacterial-Fungal Interactions, 09/01/2019-08/31/2024, $556,228, PI (UCR Subaward): Alber. The focus of this project is the development hybrid machine learning/simulation models of Pseudomonas fluorescens/ Laccaria bicolor interactions and dynamics. These hybrid data-analytic/simulation models will be used to carry out virtual experiments and develop fundamental understanding of the interactions between Pseudomonas fluorescens and Laccaria bicolor. A fundamental understanding of how a property emerges from underlying processes is developed through understanding how the physics of underlying processes result in the emergent property. For instance, how do changes in energy metabolism and signaling by chemoattractants result in the sophisticated chemotactic searches for food? At the same time, we will carry out experiments aimed at developing and testing quantitative assays to measure the same interactions, and whose data will inform the virtual experiments.

NSF Major Research Infrastructure (MRI) DBI 2215705, Acquisition of a Multipurpose HPC Cluster for Interdisciplinary Research and Training, 8/17/2022-9/1/2025.$659,979, PI: Girke, Co-PI: Alber. An award is made to the University of California, Riverside (UCR) to acquire a Big Data High-Performance Computing (BD-HPC) cluster designed to enable novel and transformative research, outreach and training activities that are highly relevant to the environment and society. The system will be managed by UCR's HPC Center (HPCC) that serves a broad and diverse user population distributed across colleges and departments. As a highly shared resource, the instrument will enable a large number of NSF-funded programs, including those aiming to improve practices in agriculture, environmental protection, technology development and industry. Extensive educational and training activities are integrated to disseminate multidisciplinary concepts of Big Data Science.

NIH grant U01 HL116330 (Predictive Multiscale Models for Biomedical, Biological, Behavioral, Environmental and Clinical Research Interagency Initiative). Multiscale modeling and empirical study of a mechanism limiting blood clot growth. 07/26/2014 - 07/30/2019,

$3,550,000, PI: Alber. Collaborative project with University of Pennsylvania School of Medicine and Argonne National Laboratory. Thrombosis is a major cause of death in the developed world and results from the growth of thrombi (blood clots forming within blood vessels) that restricts blood flow to vital organs. The project integrates multiscale modeling and experiments to examine novel hypothesis related to the role of fibrin networks in processes halting thrombus growth. This will help physicians to estimate risk of thrombotic disease for an individual patient by identifying critical values of parameters of processes regulating thrombogenesis.

NIH grant 1R01GM095959. Combined multiscale modeling and experimental study of bacterial swarming, 04/01/2012 - 12/31/2016, $1,149,272, PI: Alber. Most infections are the result of surface-attached biofilm communities of bacteria that colonize host surfaces. Pseudomonas aeruginosa is an opportunistic pathogen responsible for both acute and persistent infections in susceptible individuals, as exampled by those for burn victims and people with cystic fibrosis. A key aspect of these infections is the formation of bacterial swarms, which are surface-associated, socially organized communities of cells. Because identification of single cell behavior within groups is extremely difficult experimentally, we will use multiscale models to perform predictive simulations describing complex bacterial interactions that potentially control swarming. This combined multiscale modeling and laboratory study of bacterial behavior on surfaces will provide new critical information needed for the eradication, prevention and treatment of the P. aeruginosa infections.

NIH grant 1R01GM100470 (Joint NSF DMS/NIH NIGMS Initiative to Support Research at the Interface of the Biological and Mathematical Sciences). Study of the interplay of motility mechanisms during swarming of Myxococcus xanthus, 06/01/11 - 06/01/15, $779,565, PI: Alber. The main goal of this interdisciplinary project is to combine simulations using new three-dimensional multiscale modeling environment and specifically designed experiments to study basic coordination events of M. xanthus swarming, which is essential to understanding how millions of bacteria function in real environments. A collaboration has been established between Drs. Alber (PI), Xu, Chen, Shrout (Notre Dame), Dr. Aronson from the Argonne National Laboratory (ANL) and Dr. Kaiser from Stanford University to achieve these goals.

NSF Grant CBET-1403887 (CBET - BIOTECH, BIOCHEM & BIOMASS ENG), Decoding organ-level intercellular signaling in an active, regulated microenvironment, 05/01/14 - 04/30/17, $600,000, PI: Zartman, Co-PIs: Alber and Hoelzle. The proposed study aims to investigate the hypothesis that intercellular calcium waves encode information on the size, differentiation state and overall physiology of epithelia. To test this hypothesis, new biophysical methods will be combined with computer simulations to investigate intercellular calcium signaling in intact epithelial organs within a controlled microenvironment.

NSF grant MCB-1244593. BioMaPS: Experimental and Computational Studies of Microtubule Dynamics and Regulation by Binding Proteins, 2017 07/01/13 - 06/30/17, $667,346, PI: Goodson, Co-PI: Alber; The long-term goal of this collaborative project is to develop a comprehensive understanding of MT dynamics and its regulation by MT binding proteins though a coordinated program of multiscale computational modeling and experiment. The specific goals of this renewal are to 1) use combined experiment and modeling to establish fundamental principles for how groups of MTBinding Proteins (MTBPs) work together; 3)

define the relationship between the behavior of the bulk polymer and that of the individual MTs, and 3) develop freely available software packages to allow students and researchers at remote sites to use our models by implementing them on their own computers or running them on the web.

NSF grant MCB 0951264, Cellular Organization, Computational and Experimental Studies of Microtubule Dynamics and Regulation by Binding proteins, 03/15/10 - 03/15/13, $640,058, PI: Goodson, Co-PI: Alber. The long-term goal of this project was to develop a predictive and quantitative understanding of the MT cytoskeleton and its regulation by MTBPs, which will impact fields ranging from systems biology to nanotechnology. The flexible model and tutorials developed through this project allows researchers to develop and test specific hypotheses about the mechanisms of dynamic instability and MTBP action, which will in turn help design and direct future experiments.

Gerber Foundation. Development of technology to assess bruises. 09/15/10-/09/15/13, $90,000, PI: Alber. The main goal of this project is to use novel spectrophotometry and predictive 3D multiscale modeling to generate specific hypothesis on the age of bruises.

NSF Grant DMS-0800612 (Joint NSF DMS/NIH NIGMS Initiative to Support Research at the Interface of the Biological and Mathematical Sciences), Integrating Multiscale Modeling and in vivo Experiments for Studying Blood Clot Development, 09/01/08 - 09/01/11, $864,000, PI: Alber. The overall goal of this project was to develop 3-dimensional multiscale mathematical models and a computational toolkit for simulating thrombus formation. These models were validated with specifically designed experiments to test predictions of thrombus development, its structure and stability. Moreover, the development of models served as a generator of new hypotheses that were tested in experiments in vivo and micro fluidic devises.

NSF grant BCS 0826958, DHB. Longitudinal Analysis and Modeling of Large-Scale Social Networks, 10/01/08 - 10/01/11, $699,770, Co-PI: Alber. The data generated by digital communication technologies was used to (1) test/validate existing social network theories about the mechanisms underlying network dynamics by developing quantitative high fidelity temporal stochastic models of human behavior within social networks; (2) produce a data-driven, dynamic network modeling suite with predictive capabilities.

NSF Grant DMS-0719895, AMS-SS: Multiscale stochastic model of myxobacteria dynamics, 08/15/07-07/31/2010, $222,000, PI: Alber; A large amount of available, reliable experimental data on single wild type and mutant cell behavior and interactions between cells was used as building blocks for developing comprehensive mathematical and computational multi-dimensional hybrid model of bacterial swarming based on short and long range interactions. To bring different scale levels of description together new mathematical techniques and tools were used including elements of stochastic analysis, nonlinear analysis and kinetic theory.

NSF Grant CCF 0622940, CompBio: Simulation of self-emerging properties of coupled biochemical and cellular networks in social behavior of Myxobacteria, Biology and Information Technology, 09/01/06-08/31/09, $300,000, Co-PI:Alber. The project bridged the molecular,

subcellular, cellular, and macroscopic level models by introducing consistent mathematical and computational interfaces among them. The general approach was demonstrated by developing a multi-scale computational model of formation of Myxobacteria fruiting bodies based on short range (C-signaling) interactions, differentiation and motility regulation, and by analyzing the effect of genetic mutations on macroscopic development.

DOE: Northwest Indiana Computational Grid (NWICG), Modeling Microtubule Dynamics, 09/01/08 - 09/01/09, $50,000, PI: Alber. The focus of this project was on 1) the development of the detailed microscale model of several microtubules formation and its parallelized computational implementation; 2) development of multi-scale model of venous thrombosis.

NIH 1 RO1 GM065420: Supplement for the Study of Complex Biological Systems, 08/01/05-07/31/08, $320,000, Co-PI: Alber. This grant supported collaboration between cell biologist Holly Goodson and applied mathematician Mark Alber to use a coupled program of iterative computational modeling and experiment to investigate key aspects of dynamic microtubule systems.

NIH 1 RO1 GM76692-01: Interagency Opportunities in Multiscale Modeling in Biomedical, Biological and Behavioral NSF 04.6071, (collaboration with IU Bloomington and Medical School at Kansas University) 09/01/05-08/31/08, $800,000, Co-PI: Alber. The investigators developed an open-source comprehensive Tissue-Simulation-Toolkit (TST) using multi-scale mathematical modelling and computer simulation techniques to investigate the mechanism of segmentation during somite and limb formation.

Recent Invited Talks:

April 7, 2023, Applied Mathematics Seminar Talk, Mathematics Department, UC Santa Barbara, CA

November 21, 2022, Colloquium, Mechanical Engineering Department, UC Santa Barbara, CA

October 16-21, 2022, Hybrid BIRS-CMO Workshop on Multiscale Modeling of Plant Growth, Pattern Formation and Actuation, The Casa Matemática Oaxaca (CMO), Oaxaca, Mexico (online talk)

September 7, 2022, UBC Math Biology Seminar Series, University of British Columbia, Canada (online talk. Recording is available on Mathtube:
https://mathtube.org/lecture/video/combined-modeling-and-experimental-study-interplay-between-tissue-growth-and-shape

August 3, 2022, Rutgers University, New Brunswick, NJ (online talk)

July 14, 2022, 2022 SIAM Conference on the Life Science Minisymposium (online talk)

Dr. Alber taught a mini course consisting of 3 online lectures titled “Coupling Multiscale Modeling and Machine Learning Methods with Applications to Biology” at the MNat PhD

School BIOMAT2022: Multiscale Models and Methods in Life Sciences, Granada, Spain, from 7-10 June 2022 (online talks)

August 24-28, 2020, Online International Summer School "Modeling of Shape and Size in Biological Development", Lorentz Center, University of Leiden, The Netherlands.

June 8 - 11, 2020, Special Session on Mathematical and Computational Modeling of Blood Clotting, SIAM Life Sciences Meeting.

April 21, 2020, Invited Lecture in the UCR Science Lecture Series titled "Big Data Science". Rescheduled to 2021.

March 20, 2020, Kloosterman Lecture, Mathematics Institute, University of Leiden, Netherlands. Resceduled to 2021.

March 16, 2020, Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, Poland. Resceduled to 2021.

February 21, 2020, 2nd Research Strategy Collaboration Workshop, UCR School of Medicine

October 25-27, 2019, The PDEs and Applications to Life Sciences Workshop, Penn State University

September 27, 2019, Leiden Complex Networks Network (LCN2), Netherlands

February 2, 2019, Guest Lecture, 3-week short course in systems biology, Center for Complex Biological Systems, UC Irvine, CA

November 9, 2018, Cheeloo Conference on Computational Biomedicine, National Supercomputer Center in Jinan, Shandong Province, P. R. China.

November 4, 2018, Physics Department, Chinese University of Hong Kong, Hong Kong, P. R. China

October 25, 2018, Carolina Biophysics Symposium, University of North Carolina, Chapel Hill, NC

October 1, 2018, Inaugural Symposium, NSF-Simons Center for Multiscale Cell Fate Research, UC Irvine, CA

September 23, Conference on Differential Equations arising from Organising Principles in Biology, (MFO, Oberwolfach Research Institute for Mathematics), Oberwolfach, Germany

July 30, 2018, Special Session on Mechanical Properties of Randomly Cross-linked Semiflexible Fibrous Materials, 13th World Congress on Computational Mechanics, New York City, NY

July 26, 2018, Mechbio Conference 2018: The Mechanome in Action, UC Irvine, CA

June 6, 2018, Conference on Multiscale Problems in Materials and Biology, The Fields Institute for Research in Mathematical Sciences, University of Toronto, Canada

April 22, 2018, NSF Biofilm Mechanical Properties Workshop, University of Notre Dame

January 12, 2018, Coupled Multi-scale Modeling and Experimental Study of Blood Clot Contraction and Deformation, SSH Forum on Simulation and Modeling in Healthcare, Los Angeles Convention Center

December 1, 2017, Mathematics Colloquium, UC Merced

October 20, 2017, Invited Talk, Retreat of the Institute for Integrative Genome Biology, UC Riverside

October 10, 2017, Colloquium, Universite Paris Diderot, Paris, France

July 18, 2017, Invited Talk, Annual Meeting of the Society for Mathematical Biology, Salt Lake City, UT

May 3, 2017, Claremont Colleges Mathematics Colloquium, Claremont, CA

April 24, 2017, Mathematical Biology Colloquium, University of California, Davis, CA

February 1, 2017, Bioengineering Colloquium, University of California, San Diego

January 28, 2017, Invited Speaker at the 7th Annual Southern California Systems Biology Conference, University of California, Irvine

January 25th, 2017, Applied Mathematics Colloquium, Stanford University, Palo Alto, CA

September 4, 2016, Invited Talk, Workshop: Computing a Tissue, Modeling Multicellular Systems, 15th European Conference on Computational Biology, World Forum, The Hague, Netherlands

August 4th, 2016, Invited Talk, Mechbio Symposium: Putting together the Cell Mechanome, UC San Diego

February 13, 2016, Keynote Speaker at the 8th International Bio-fluid Mechanics Symposia, Caltech, Passadena, CA:

November 14, 2015, Invited Talk, AMS Eastern Regional Meeting, Special Session "Multi-scale Methods in Cell and Developmental Biology", Rutgers University, Newark, NJ

September 8, 2015, Invited Talk, Meeting of the Interagency Modeling and Analysis Group (IMAG), Multiscale Modeling (MSM) Consortium, NIH, Bethesda, MD

September 2, 2015, Invited Talk, Computational Fluid Dynamics (CFD) in Medicine and Biology II An ECI Conference Series, Albufeira, Portugal

July 28, 2015, Invited Talk, 13th US National Congress on Computational Mechanics, San

Diego, CA

May 8, 2015, Plenary Lecture, Workshop on Interdisciplinary Mathematics, Penn Sate University, PA

October 22, 2014, Applied Mathematics Colloquium, Duke University, Durham, NC

October 22, 2014, Applied Mathematics Colloquium, Stanford University, Palo Alto, CA

May 12, 2014, Invited Talk, 111th Statistical Mechanics Conference, Rutgers University, Piscataway, NJ

December 10, 2013, Invited Talk, SIAM Conference on Analysis of Partial Differential Equations, Special Session on Applications of PDEs to Biology, Lake Buena Vista, Florida

December 6, 2013, Mathematics Colloquium, IUPUI, IN

October 26, 2013, Invited Talk, Meeting of the Editorial Board of the PLoS Computational Biollogy, Washington DC.

October 24, 2013, Distinguished Lecture in Applied Mathematics, University of Massachusetts, Amherst, MA

October 1, 2013, Invited Talk, Seminar of the Center for Theoretical Biological Physics, Rice University, Houston, TX

May 6, 2013, Colloquium, Northeastern University, Boston, MA

March 26, 2013, Colloquium, North Carolina State University, Raleigh, NC

February 12, 2013, Colloquium, Dartmouth College, Hanover, NH

November 5, 2012, Invited Talk, Workshop on Collective Motion in Biological Systems: from Data to Models, Center for Interdisciplinary Research (ZiF), Bielefeld University, Germany

October 15, 2012, Invited Talk, Stowers Institute for Medical Research, Kansas City, Missouri

September 9, 2012, Colloquium, Institute for Medicine and Engineering (IME), University of Pennsylvania, Philadelphia, PA

August 8, 2012, Invited Talk, SIAM Meeting on Life Sciences, San Diego, CA

July 29, 2012, Invited Talk, Myxo 2012: 39th International Conference on the Biology of the Myxobacteria, July 29 - August 1, 2012, Chicago, IL

May 1, 2012, Invited Talk, 3rd International Conference on Engineering Frontiers in Pediatric and Congenital Heart Disease, Stanford University, Palo Alto, CA

April 17, 2012, Colloquium, Department of Mathematics, University of South Alabama,

Mobile, AL

April 16, 2012, Colloquium, Department of Mathematics, University of South Carolina, Columbia, SC

April 12, 2012, Colloquium, Harper Cancer Research Institute, Indiana University School of Medicine, South Bend, IN

March 1, 2012, Invited Talk, Invited Session: Physical Mechanisms of Collective Microbial Dynamics, American Physical Society March Meeting 2012, Boston, MA

February 9, 2012, Colloquium, Department of Applied Mathematics, University of Washington, Seattle, WA

November 4, 2011, Invited Talk, Department of Mathematics, Duke University, NC

October 13, 2011, Invited Talk, 48th Annual Technical Conference of Society of Engineering Sciences, Northwestern University, Evanston, Illinois.

April 12, 2011, Invited Talk, Principles and Theory of Self-Assembly, 7th Annual Conference on Foundations of Nanoscience: Self-assembled Architecture and Devices (FNANO 2011), Snowbird Cliff Lodge, Snowbird, Utah.

February 24, 2011, Mathematical Physics Colloquium, Rutgers University, New Brunswick, NJ.

February 2, 2011, Colloquium, Department of Mechanical Engineering, UC San Diego, CA.

September 14, 2010, Invited Talk, The Hot Topics Workshop "Medical Device-biological Interactions at the Material-tissue Interfaces", Institute for Mathematics and Its Applications (IMA), University of Minnesota, Minneapolis, MN.

June 25, 2010, Applied Mathematics Colloquium, Imperial College, London, UK.

June 21, 2010, Invited Talk, OCCAM Conference on Modelling at different scales in biology, St Anne's College, Oxford University, UK.

May 10, 2010, Invited Talk, 103rd Statistical Mechanics Conference, Rutgers University, NJ.

April 17, 2010, Plenary Talk, SIAM Great Lakes Conference: Modeling and Numerical PDEs in Mathematical Biology, University of Michigan-Dearborn, MI.

March 8, 2010, Applied Mathematics Colloquium, Department of Mathematics, Massachusetts Institute of Technology, Boston, MA

January 22, 2010, Mathematics Colloquium, Case Western University, Cleveland, OH

October 27, 2009, Workshop on Self-Organization and Multi-Scale Mathematical Modeling of Active Biological Systems, NSF Statistical and Applied Mathematical Sciences Institute

(SAMSI), Research Triangle Park, NC

October 12, 2009, Conference on Agent-Based Complex Systems, NSF Institute for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, CA

September 26, 2009, Symposium on Engineered and Natural Complex Systems-Modeling, Simulation and Analysis, 2009 IEEE Toronto International Conference - Science and Technology for Humanity, Canada

August 30, 2009, Tutorial Lecture, 2009-10 Program on Stochastic Dynamics, NSF Statistical and Applied Mathematical Sciences Institute (SAMSI), Research Triangle Park, NC

August 24, 2009, Plenary Talk, Workshop, NSF Mathematical Biology Institute, Columbus, OH

July 23, 2009, Invited Talk, Center for Mathematical Biology, Oxford University, UK

July 22, Invited Talk, Conference on Cardiac Physiome Project, Newton Institute, Cambridge University, UK

April 10, 2009, Applied Mathematics Colloquium, Department of Mathematics, Stanford University, Palo Alto, CA

April 3, 2009, Colloquium, Department of Mathematics, New Jersey Institute of Technology, Newark, NJ

April 2, 2009, Department of Mathematics, Rutgers University, Piscataway, NJ

March 11, 2009, Department of Mechanical Engineering, University of California, Santa Barbara, CA

November 17, 2008, Department of Control Theory and Dynamical Systems, Caltech, Pasadena, CA

November 14, 2008, Department of Mathematics, University of California, Irvine, CA

October 14, 2008, Pattern Formation and Development in Colonial Organisms, NSF Mathematical Biology Institute, Ohio State University, Columbus, OH

August 6, 2008, Mini symposium on Networks Structure and Dynamics, SIAM Meeting in Life Sciences, Montreal, Canada

July 31, 2008, Mini symposium on Multiscale Modeling in Biology, Annual Meeting of the Society for Mathematical Biology Conference, Toronto, Canada

July 25, 2008, NSF EMT Workshop, Princeton University, NJ

29 February 2008, Department of Systems Biology, Harvard Medical School, Boston

December 10, 2007, Workshop on Biomechanics and Chemotaxis, Johann Radon Institute

for Computational and Applied Mathematics (RICAM), Linz, Austria

November 12, 2007, Conference on Microfluids, NSF Mathematical Biosciences Institute, Columbus, Ohio

October 5, 2007, Special Session on Networks, American Mathematical Society regional meeting, De Paul University, Chicago

July 24, 2007, 6th European Conference on Computational Biology (ECCB), Vienna, Austria

June 1, 2007, Plenary Invited Talk, Indy Midwest Regional Bioinformatics Conference, IUPUI Conference Center, Indianapolis, IN

May 21, 2007, Conference on Mathematical Issues in Stochastic Approaches for Multiscale Modeling, Mathematical Sciences Research Institute, Berkeley, CA

March 16, 2007, Applied Mathematics and Computational Science (AMCS) Colloquium, University of Pennsylvania, Philadelphia

March 12, 2007, Department of Genetics, Indiana University Medical School, Indianapolis

University Service:

2020 - present, Member of the UCR Committee on Academic Personnel (CAP)

2017 - present, Director, UCR Interdisciplinary Center for Quantitative Modeling in Biology

2020 - present, Member of the CNAS Awards Committee, UCR

2021 - present, Member of the Strategic Committee, Department of Mathematics, UCR

2021 - present, Member of the Undergraduate Committee, Department of Mathematics, UCR

2020 - 2021, Chair of the Colloquium Committee, Department of Mathematics, UCR

2019 - present, Member of the Advisery Board of the UCR Center for Robotics and Intellegent Systems

2017 - 2019, Member of the Advisory Board to the Office of Reseach and Economic Development, UC Riverside

2017-2020, Memeber of the Colloquium Committee, Department of Mathematics, UCR

2003 - 2016: Director, Interdisciplinary Center for the Study of Biocomplexity, University of Notre Dame

2012 - 2013: Member of the Talent Subcommittee of the University of Notre Dame Corporate Governance Committee

2008-2010, Member of the University of Notre Dame Committee on Statistics

2005-2009: Member of the Faculty Advisory Committee of the Center for Research Computing, University of Notre Dame

2006-2007: Member of the University of Notre Dame Graduate Council

2006 - 2010: Member of the Board of the Center for Applied Mathematics, University of Notre Dame

2005-2006: Member of the University of Notre Dame Council for Academic Technologies

Service to the field:

October 28-30. 2020 - Member of the NSF CAREER Panel

April 7, 8 & 9, 2020 - Member of the Review Committee, 5 Yr. Review of the Institute for Quantitative and Computational Biosciences (QCBio), Division of Life Sciences - UCLA

February 26, 2020 - Member of the NIH (National Institute on Drug Abuse) Special Emphasis Panel ZDA1 HXO-H (12), Leveraging Big Data Science to Elucidate the Neural Mechanisms of Addiction and Substance Use Disorder

June 13-14, 2019 - Member of the NIH Modeling and Analysis of Biological Systems (MABS) Study Section

February 7-13, 2019 - Member of the Joint NSF DMS/NIH NIGMS Panel B

October 18-19, 2018 - Member of the NIH Modeling and Analysis of Biological Systems (MABS) Study Section

March 19th, 2018, Member of the NIH/NIGMS Biomedical Technology Research Resource (BTRR) P41 Review Panel, ZRG1 BST -H (40)

February 12, 2018 - Member of the NIH (National Institute of Biomedical Imaging and Bioengineering) Special Emphasis Panel/Scientific Review Group, MSM Program Review

2017 - Reviewer of the Proposals for the NSF-Simons Research Centers for Mathematics of Complex Biological Systems (MathBioSys)

November 2, 2017 - Member of the NIH (National Institute of Biomedical Imaging and Bioengineering) Special Emphasis Panel ZEB1 OSR-C (J2) MSM Program Review

October 16, 2017 - Member of the NSF Mathematical Biology CAREER Panel

February 23, 2017 - member of the NIH (National Institute of Biomedical Imaging and Bioengineering) Special Emphasis Panel/Scientific Review Group 2017/05 ZEB1 OSR-C (M1) S, MSM Program Review

October 6-8, 2016 – Meember of the NIH Panel for the NIBIB Biomedical Technology

Resource (P41) Center grant applications, site visit meeting

June 16, 2016, Member of the NIH (National Institute of Biomedical Imaging and Bioengineering) Special Emphasis Panel ZEB1 OSR-C (O1) MSM Program Review

Postdoctoral Associates:

University of California, Riverside:

2020 - 2021, Jolene Britton

2020 - 2022t, Kevin Tsai

2018 - 2022, Francesco Pincaldi

2015-2019, Ali Nematbakhsh, Oleg Kim

2015-2017, Shixin Xu,

University of Notre Dame:

2014-2016, Peter Hook

2014-2015, Ling Xu, Ava Mauro, Nydia Morales Soto

2012-2014, Ziheng Wu, computational biology

2013-2014, Cameron Harvey, computational biology

2012-2013, Giordano Tierra Chica, computational and mathematical biology

2010-2013, Oleg Kim, computational and mathematical biology

2011-2014, Nydia Morales Soto, microbiology

2011-2012, Xiaomin Liu, image reconstruction and analysis

2009-2010, Chris Sweet, computational and mathematical biology

2009-2010, EunJung Kim, computational and mathematical biology

2005-2008, Nan Chen, computational and mathematical biology. He is currently a Computational Scientist at University of Texas, M.D. Anderson Cancer Center, Houston, TX.

2005-2008, Gennady Margolin, computational and mathematical biology. He is currently a Bioinformatics Scientist at National Institutes of Health, Bethesda, MD.

2005-2006, Pavel Lushnikov, mathematical biology. He is currently Full Professor, Department of Mathemtics, University of New Mexico.

2004-2006, Olga Sozinova, mathematical biology

2001-2004, Rajiv Chaturvedi, mathematical biology

2003-2004, Bogdan Kazmierczak, mathematical biology

2001-2002, Xinan Zhang, mathematical biology

1995-1997, Gregory Luther, NSF Math. Sci. Postdoctoral Industrial Research Fellowship

Graduate Students:

University of California, Riverside:

2019-present, Jennifer Rangel Ambriz

2015-present, Daniel Colister

2015-present, Christian Michael

2014-2019, Mikahl Banwarth-Kuhn

2015-2020, Samuel Britton

2015-2021, Kevin Tsai

University of Notre Dame:

2012-17, Francesco Pancaldi (Applied Mathematics)

2012-17, Shant Mahserejian (Applied Mathematics)

2012-17, Aboutaleb Amiri (Physics)

2010-2016, Timur Kupaev (Applied Mathematics)

2011-2015, Amy Buchmann, Wenzhao Sun (Applied Mathematics)

2010-2014, Chunlei Li (Applied Mathematics) (reserach department at Amazon)

2010-2015, Cameron Harvey (Physics) (Director of Academics at Visible Music College)

2008-2013, Joshua Lioi (Applied Mathematics) (postdoc associate, U Arizona)

2008-2013, Huijing Du (Applied Mathematics) (postdoc associate, UC Irvine)

2007-2012, Yuan Liu (Applied Mathematics) (postdoc associate, Michigan State U)

2005-2012, Tanya Salyers (Applied Mathematics) (currently at Amazon)

2005-2010, Richard Gejji (Applied Mathematics) (currently at the Department of Defense)

2005-2009, Jianfeng Zhu (Applied Mathematics) (analyst, Mendoza College of Business,

University of Notre Dame)

2005-2009, Yilin Wu (Physics) (Assistant Professor, Chinese University of Hong Kong))

2005-2008, Scott Christley (Computer Science) (currently research scientist, University of Chicago)

2003-2008, Matt Rissler (Mathematics) (Assistant Professor of Mathematics, Loras College, Iowa)

2003-2008 Ivan Gregoretti (Biochemistry) (currently at Cell Signaling Technology, Boston, MA)

2000-2004, Maria Byrnei (Mathematics) (Associate Professor of Mathematics, University of South Alabama)

1995-2000, Charles Miller (Mathematics) (Twitter, Computer Security Department)

Master's Students (separate from Ph.D. Program), University of Notre Dame:

2012 - 2013, Tomas Collins, ESTEEM Professional Science and Engineering Master's (PSEM) Program

2012 - 2013, Natasha Flores, ESTEEM Professional Science and Engineering Master's (PSEM) Program

2011-2012, Stephen Gaudet, ESTEEM Professional Science and Engineering Master's (PSEM) Program

2008-2010, Faruck Morcos (also received Ph.D. in Computer Science and Engineering)

2007-2008, Zhenyu Shi; 2005-2006, Fang Qi; 2004-2005, Xuelian Zhu; 2002-2004, Mihaela Vajiac; 1999-2001, Olga Vasillieva

1998-99, Andrea Bieberich

Undergraduate Students, REU Program:

Summer 2017, Andrew Wittaker, Plant biology project

Summer 2011, John Riley, NSF REU, Myxobacteria project

Summer 2008, Jose Garcia (McNair Scholar), David Sheehan (NSF REU Nano/Bio Summer School)

Summer 2007, Fernando Monjarez (McNair Scholar, now in a Ph.D. program in physics at Texas Tech University), Jeston Edwin Greenwood

Summer 2006, Anudha Mittal (NSF REU Nano/Bio Summer School)

2005-2006: James Boyle

2003-2004: Adam Willis

Summer 2004, Michael Bell

High School Teachers: Summers 2008-2015

Helene Dauerty, Physics teacher, Central High School, Elkhart, Indiana

Tom Finke, Lead Mathematics and Science Teacher, Associate Head of School, Trinity School at Greenlawn, South Bend, Indiana

Mike Sinclair, Physics and mathematics instructor, Kalamazoo Area Mathematics and Science Center, Kalamazoo, Michigan

Professional Societies:

Society for Mathemtical Biology

Society for Industrial and Applied Mathematics (SIAM)

American Association for the Advancement of Science (AAAS)

Biophysical Society

Organization of Conferences:

June 13-17, 2021, Chair of the Organizing Committee of the vertual 2021 Annual Meeting of the Society for Mathematical Biology (SMB). 2.600 registered participants with speakers from 57 countries. The conference was held 24/7 with the help of two professional societies from Europe and Asia. Special emphasis was on the impact of Mathematical Biology on Translational Science and Promotion of Diversity, Equity, and Inclusion. Webcite: https://www.smb2021.org/

August 24-28, 2020, Co-organizer of the Online International Summer School "Modeling of Shape and Size in Biological Development", to be run by the Lorentz Center, University of Leiden, The Netherlands. It was initially planned to be held at the Lorentz Center.

February 10, 2020, Co-organizer of the Dimitrios Morikis Memorial Symposium on Computational Biology, UC Riverside.

February 1st, 2020, Co-organizer of the 9th Annual Southern California Regional Systems Biology Conference, UC Riverside (160 participants).

November 9-10, 2019, Co-organizer of the American Mathematical Society Western Sectional Meeting Special Session on Machine Learning and Multiscale, Multiphysics Challenges, UC Riverside.

October 24-25, 2019, Co-organizer of the Theme 1: Ordinary Differential Equations at

the Conference on Integrating Machine Learning with Multiscale Modeling for Biomedical, Biological, and Behavioral Systems (2019 ML-MSM) held in Bethesda, Maryland (NIH Campus)and organized by the Interagency Modeling and Analysis Group (IMAG).

August 24-28, 2019, Co-organizer of the Convergence Accelerator Team Meeting held at the NSF Simons Center for Multiscale Cell Fate Research at UC Irvine: "An interdisciplinary approach to study emerging epithelial morphogenesis driven by multiscale cellular dynamics"

March 6, 2019, Co-organizer of the Special Session on Machine Learning in Multiphysics and Multiscale Computing, William H. Natcher Building / Building 45 on the NIH main campus in Bethesda, MD., 120 attendees.

February 15, 2019, Co-organizer of the Special Session on Mathematical Modeling of Diseases: Translational Approaches (sponsored by the Mathematical Section of the AAAS), 2019 Annual Meeting of the American Association for the Advancement of Science (AAAS), 100 attendees.

November 15-16, 2017, Co-organizer of the Conference on "Multi-scale systems biology methods for studying biomedical processes in patients under stress or with chronic or acute diseases", UC Riverside, 100 attendees.

November 4, 2017, Co-organizer of the Special Session: Stochastic and Multi-scale Models in Mathematical Biology, Analysis and Simulations, at the AMS Fall Western Sectional Meeting, University of California, Riverside, CA.

March 6-10, 2017, Co-organizer of the Workshop 2: Modelling of Tissue Growth and Form, NSF Mathematical Biology Institute, Columbus, OH.

December 15, 2016, Co-organizer of the Interdisciplinary Workshop on Multi-scale Modeling of Complex System in Developmental & Plant Biology, UC Riverside.

February 14-18, 2013, Co-organizer of the Symposium on the Multi-scale Study of Cancer, Annual Meeting of the American Association for Advancement of Science (AAAS), Boston.

June 11th - 12th, 2012, Co-organizer of the Workshop on the Physics of Bacterial Communities, sponsored by the Argonne National Laboratory and University of Notre Dame, University of Notre Dame Chicago Commons.

July 18-19, 2011, Co-organizer, Workshop on Interdisciplinary Biomedical Research, University of Notre Dame London Center, UK.

March 1-3, 2009, Co-organizer, Workshop on Interdisciplinary Biomedical Research, University of Notre Dame

November 2-4, 2008, Co-organizer, Focus Group Meeting: Multiscale Methods in Biology, NSF Mathematical Biology Institute, Ohio State University, Columbus, OH,

August 6, 2008, Co-organizer, Special Session on Multiscale Methods in Biological Model-

ing: Hybrid Systems and Coarsening Methods, SIAM Meeting in Life Sciences, Montreal, Canada,

April 10 - 11, 2008, Co-organizer, Workshop on Interdisciplinary Biomedical Research between University of Notre Dame and Indiana University School of Medicine, University of Notre Dame.

April 8 - 9, 2006, Co-organizer, Special Session on Mathematical Biology: Modeling Cancer, AMS Meeting, University of Notre Dame.

March 24-36, 2006, Co-organizer, Workshop on Stochastic Modelling, Notre Dame

April 7-9, 2006, Co-organizer, Special Session on Mathematical Biology, American Mathematical Society Meeting, Notre Dame

October 28-30, 2005, Co-organizer, Workshop on Applications of Methods of Stochastic Systems and Statistical Physics in Biology, University of Notre Dame

July 4-7, 2005, Member of the Scientific Committee, Managing Complexity - Systems Biology, 7th World Congress of Chemical Engineering (WCCE 2005), Glasgow, Scotland

October 28-30, 2005, Organizer, Biocomplexity Workshop VIII: Applications of Methods of Stochastic Systems and Statistical Physics to Biology, University of Notre Dame

April 8-9, 2006, Co-organizer, Special Session on Mathematical Biology, American Mathematical Society Meeting, University of Notre Dame

May 9 - 11, 2005, Co-organizer, Biocomplexity Workshop VII: Unravelling the Function and Kinetics of Biochemical Networks: from Experiments to Systems Biology, IU Bloomington

May 12 - 16, 2004, Co-organizer, Biocomplexity Workshop VI: Complex Behavior in Unicellular Organisms, IU Bloomington

August 14 - 17, 2003, Organizer, Biocomplexity Workshop V: Multiscale Modeling in Biology, University of Notre Dame

May 15 - 18, 2003, Co-organizer, Biocomplexity Workshop IV: Regenerative Biology and Medicine, University of Indiana, Bloomington

November 8-10, 2002, Co-organizer, Biocomplexity Workshop III: The Role of Tissue Mechanics in Biological Responses to Mechanical Loading, University of Notre Dame

August 12-16, 2002, Member of a Program Committee of the 17th International Symposium on Mathematical Theory of Networks and Systems, University of Notre Dame, Co-organizer of a mini-symposium on applications to biology.

November 10-11, 2001, Co-organizer, Notre Dame Workshop on Modeling Cytoskeleton and Cell Motility, University of Notre Dame

July 11-14, 2001, Co-organizer of 2 invited Mini-symposiums on Applications of Nonlinear

Dynamical Systems in Biology, Fifth SIAM Conference on Control and its Applications held jointly with the 2001 SIAM Annual Meeting, San Diego

April 7, 2000, Co-organizer, Conference on Nonlinear Problems in Applied Mathematics, University of Notre Dame

April 8-9, 2000, Co-organizer, Special session on Nonlinear Waves and Integrable Systems, AMS Meeting, University of Notre Dame

Newly Developed Courses:

Part three of the applied mathematics sequence (MATH 206C): Introduction to Applied Mathematics

Graduate Course: Multi-scale modeling in biology and physics

Graduate Course: Topics in Applied Mathematics, Mathematical Biology

Cross listed Course: Nonlinear Dynamical Systems

Cross listed Course: Mathematical and Computational Modeling in Biology and Physics

Undergraduate Seminar on Interdisciplinary Biological Research: Mathematical and Computational Modeling in Biology

Miscellaneous: Married, two sons