

CURRICULUM VITAE

Alex Mogilner

Professor

Department of Neurobiology, Physiology and Behavior and Department of Mathematics
University of California, Davis

Davis, CA 95616

Telephone: (530)752-1072, Fax: (530)752-6635

E-mail: mogilner@math.ucdavis.edu

Home page: <http://www.math.ucdavis.edu/~mogilner/>

1 Education

Ph.D., Appl. Math., Univ. of British Columbia, Vancouver, Canada, 1995

Ph.D., Physics, USSR Academy of Sciences, Sverdlovsk, USSR, 1990

M.Eng., Engineering Physics, Ural Polytech. Inst., Sverdlovsk, USSR, 1985

2 Positions

2002-present: University of California, Davis, USA:

Professor of Mathematics and Neurobiology.

1999-2002: University of California, Davis, USA:

Associate Professor of Mathematics.

1996-1999: University of California, Davis, USA:

Assistant Professor of Mathematics.

1995-96: University of California, Berkeley, USA:

Research Fellow, Program in Mathematics and Molecular Biology.

1992-95: University of British Columbia, Vancouver, Canada:

Teaching and research assistant, Department of Mathematics.

1990-92: University of Manitoba, Winnipeg, Canada:

Research Associate, Department of Physics.

1985-90: Institute for Metal Physics of the USSR Academy of Sciences:

Researcher, Department of Mathematical and Theoretical Physics.

3 Visiting positions

2004 (April - July): Isaak Newton Institute for Mathematical Sciences, University of Cambridge, England: Visiting Professor.

2001 (September - November): Isaak Newton Institute for Mathematical Sciences, University of Cambridge, England: Visiting Professor.

2000 (January - March): University of Utah, Salt Lake City, USA: Visiting Professor, Department of Mathematics.

4 Awards, fellowships, grants

Current:

NIH RO1 grant NIGMS GM068952 ‘Modeling mitotic spindle assembly’. PI, 2007-2012.

NSF Grant No. DMS 0715729 ‘Mechanochemical Regulation of the Motile Cell Shape’. PI, 2007-2010.

NIH GLUE grant NIGMS U54 GM64346 ‘Cell Migration Consortium’. Co-PI, 2006-2011.

Past:

NIH RO1 grant NIGMS GM068952-01 ‘Dynamics of Mitotic Spindle Morphogenesis’. PI, 2003-2007.

NSF Grants No. DMS 9707750, 1097749, 0315782 on mathematical models of cellular movements. PI, 1997-2006.

NIH GLUE grant ‘Cell Migration Consortium’. Co-PI, 2001-2006. Chancellor’s Fellowship, University of California, Davis, 2000-2005.

Fellowship in Mathematics and Molecular Biology, University of California, Berkeley, 1995-96.

Excellence in Teaching Award, University of British Columbia, 1995.

5 Conferences

5.1 Recent invited talks at the conferences

1. International conference “Common trends in traffic systems: Physical and Computational Models in Transportation Engineering and Biological Sciences” (February 7 - 10, 2006, IIT Kanpur, India).

Invited Lecture: Biophysics of the Mitotic Spindle.

2. International Systems Neurobiology Spring School (March 16 - 18, 2006, Nara, Japan).

Invited Lecture: Ratchet models in biology.

3. International Workshop “Physics of Biological Systems” (June 19 - 25, 2006, Dresden, Germany).

Invited Lecture: A Spatially Regulated Change in Microtubule Dynamics at Anaphase B onset in *Drosophila* Mitotic Spindles.

4. Annual Meeting of Biophysical Society (March 3-6, 2007, Baltimore).

Invited Lecture: How keratocytes crawl.

5. Morphogenesis and Regenerative Medicine Symposium (May 23-25, 2007, Charlottesville, VA).

Invited Lecture: Reverse Engineering of Mitotic Spindle.

6. International Workshop in Physics of Biological Matter (2-7 September, 2007, Safed, Israel).

Invited Lecture: Biophysics of motile cell shape.

5.2 Recent organized courses, sessions and conferences; series of lectures and mini-courses

1. Lecturer at winter school on “Cell Motility” at National Center for Theoretical Sciences, Hsinchu (Jan 11-14, 2006)
2. Lecturer at summer school on “Computational Biology” at Instituto Gulbenkian de Cincia, Lisbon (June 26-30, 2006)
3. Lecturer at summer school on “Mathematics in Molecular Cell Biology” at RICAM, Linz, Austria (September 18-23, 2006)
4. Lecturer at summer school on “Bio-Systems” at Beijing (September 25-30, 2006)
5. Mini-symposium “Quantitative applications in cell biology” at Annual Meeting of the American Society for Cell Biology, San Diego (December 9-13, 2006)
6. Section “Motility and Mitosis” at Computational Cell Biology Symposium, Cold Spring Harbor (March 6-9, 2007)
7. Lecturer at spring school on I2CAM - FAPERJ biophysics school at Rio de Janeiro (March 17-21, 2008)

6 Professional activities

- Chair of NIH panel “Modeling and Analysis of Biological Systems”.
- Associate Editor, Bulletin of Mathematical Biology.
- Editorial Board Member, Biophysical Journal.

Publication List

- [1] R.A.Minlos, A.Mogilner, Spectrum analysis and scattering theory for a three-particle cluster operator, in *Mathematical Problems of Statistical Mechanics and Dynamics*, R.L.Dobrushin, Ed., pp. 139-160, Reidel, North Holland (1986).
- [2] A.Mogilner, On weakly bound states of several quasi-particles in a three-dimensional crystal, *Soviet Journal of Low Temperature Physics*, **14**: 536-538 (1988).
- [3] R.A.Minlos, A.Mogilner, On the bound states of two weakly interacting quasi-particles with a strongly degenerated dispersion relation, *Soviet Journal of Low Temperature Physics*, **14**: 592-594 (1988).
- [4] A.Mogilner, The problem of a few quasi-particles in solid state physics, in *Applications of Self-Adjoint Extensions in Quantum Physics*, P.Exner. and P.Seba, Eds., pp. 160-173, Springer, Berlin (1989).
- [5] R.A.Minlos, A.Mogilner, Some problems concerning spectra of lattice models, in *Schrodinger Operators:Standard and Nonstandard*, P.Exner. and P.Seba, Eds., pp. 243-258, World Scientific, Singapore, (1989).
- [6] A.Mogilner, Magnon bound states in an easy-axis Heisenberg ferromagnet of arbitrary dimensionality: Relation to magnetic solitons, *Soviet Journal of Experimental and Theoretical Physics*, **69**: 1033-1037 (1989).
- [7] A.Khaitov, A.Mogilner, Bound states of two electrons and a magnon in SD Model, *Soviet Physics Doklady*, **34**: 886-887 (1989).
- [8] A.Mogilner, M.H.Shermatov, Binding of two fermions with the third different particle by a point-like interaction, *Physics Letters A* **149**: 398-400 (1990).
- [9] A.I.Artemjev, A.Mogilner, Bound states and scattering of two quasi-particles with a linear dispersion law, *Physics Letters A* **152**: 477-480 (1991).
- [10] A.N.Melnikov, A.Mogilner, A generalization of Iorio-O'Carroll theorem to the case of lattice Hamiltonian, *Journal of Physics A* **24**: 3671-3676 (1991).
- [11] A.Mogilner, Hamiltonians in solid state physics as multiparticle discrete Schrodinger operators: Problems and results, *Advances in Soviet Mathematics*, **5**: 139-194 (1991).
- [12] A.Mogilner, P.D.Loly, Vanishing gaps in 1D bandstructures, *Journal of Physics A* **25**: L855-L860 (1992).
- [13] A.Mogilner, J.A.Tuszynski, Analytical solutions to classical nonlinear wave equations and their quantum meaning, *Nuovo Cimento B* **108**: 1159-1170 (1993).

- [14] A.Mogilner, L.Edelstein-Keshet, Selecting a common direction. I. How orientational order can arise from simple contact responses between interacting cells, *Journal of Mathematical Biology*, **33**: 619-660 (1995).
- [15] A.Mogilner, L.Edelstein-Keshet, G.B.Ermentrout, Selecting a common direction. II. Peak-like solutions representing total alignment of cell clusters, *Journal of Mathematical Biology*, **34**: 811-842 (1996).
- [16] A.Mogilner, L.Edelstein-Keshet, Spatio-angular order in populations of self-aligning objects: formation of oriented patches, *Physica D*, **89**: 346-367 (1996).
- [17] A. Mogilner, G.Oster, Cell motility driven by actin polymerization, *Biophysical Journal*, **71**: 3030-3045 (1996).
- [18] A. Mogilner, G.Oster, The physics of lamellipodial protrusion, *European Biophysics Journal*, **25**: 47-53 (1996).
- [19] V. Lendowski, A. Mogilner, Origin of actin-induced locomotion of *Listeria*, in *Dynamics of Cell and Tissue Motion*, W.Alt, A.Deutsch and G.Dunn, Eds., pp. 93-99, Birkhaeuser, Basel (1997).
- [20] J. Cook, A. Deutsch, A. Mogilner, Models for spatio-angular self-organization in cell biology, in *Dynamics of Cell and Tissue Motion*, W.Alt, A.Deutsch and G.Dunn, Eds., pp. 173-182, Birkhaeuser, Basel (1997).
- [21] H.-Y. Wang, T. Elston, A. Mogilner, G.Oster, Force generation in RNA Polymerase, *Biophysical Journal*, **74**: 1186-1202 (1998).
- [22] A.Mogilner, M.Mangel, R.J.Baskin, Motion of molecular motor ratcheted by internal fluctuations and protein friction, *Physics Letters A* **237**: 297-306 (1998).
- [23] E. Geigant, K. Ladizhansky, A. Mogilner, An integro-differential model for orientational distribution of F-actin in cells, *SIAM Journal of Applied Mathematics*, **59**: 787-809 (1998).
- [24] A. Mogilner, G.Oster, The polymerization ratchet model explains the force-velocity relation for growing microtubules, *European Biophysics Journal*, **28**: 235-242 (1999).
- [25] A.Mogilner, L.Edelstein-Keshet, A non-local model for a swarm, *Journal of Mathematical Biology*, **38**: 534-570 (1999).
- [26] A. Mogilner, E. Marland, D. Bottino, A minimal model of locomotion applied to the steady 'gliding' movement of fish keratocyte cells, in *Mathematical models for biological pattern formation*, P. Maini and H. Othmer, Eds., pp. 269-294, Springer, New York (2001).

- [27] C. Lee, M. F. Hoopes, J. Diehl, W. Gilliland, G. Huxel, E. Liever, K. McCann, J. Umbanhowar, A. Mogilner, Nonlocal concepts and models in biology, *Journal of Theoretical Biology*, **210**: 201-219 (2001).
- [28] A. Mogilner, A. J. Fisher, R. J. Baskin, Structural changes in the neck linker of kinesin explain the load dependence of the motor's mechanical cycle, *Journal of Theoretical Biology*, **211**: 143-157 (2001).
- [29] O. Igoshin, A. Mogilner, R. Welch, D. Kaiser, G. Oster, Pattern formation and traveling waves in myxobacteria: Theory and modeling. *Proc. Nat. Acad. Sci. USA*, **98**: 14913-14918 (2001).
- [30] A. Mogilner, T. Elston, H.-Y. Wang, G. Oster, Molecular motors: Theory, in *Joel Keizer's Computational Cell Biology*, C. P. Fall, E. Marland, J. Tyson and J. Wagner, Eds., pp. 321-355, Springer, N.Y. (2002).
- [31] A. Mogilner, T. Elston, H.-Y. Wang, G. Oster, Molecular motors: Examples, in *Joel Keizer's Computational Cell Biology*, C. P. Fall, E. Marland, J. Tyson and J. Wagner, Eds., pp. 356-380, Springer, N.Y. (2002).
- [32] D. Bottino, A. Mogilner, T. Roberts, M. Stewart, G. Oster, How nematode sperm crawl. *J. Cell Science*, **115**: 367-384 (2002).
- [33] A. Mogilner, L. Edelstein-Keshet, Regulation of Actin Dynamics in Rapidly Moving Cells: A Quantitative Analysis. *Biophys. J.*, **83**: 1237-1258 (2002).
- [34] J. M. Scholey and A. Mogilner, Mitotic Spindle Motors, in *Molecular Motors*, pp. 327-355. M. Schliwa, Ed., Wiley-VCH (2002).
- [35] A. Mogilner, D. Verzi, A Simple 1-D Physical Model for the Crawling Nematode Sperm Cell. *J. Stat. Phys.*, **110**: 1169-1189 (2003).
- [36] E. Cytrynbaum, J. Scholey, A. Mogilner, A force balance model of early spindle pole separation in *Drosophila* Embryos. *Biophys. J.*, **84**: 757-769 (2003).
- [37] A. Mogilner, G. Oster, Force generation by actin polymerization II: The elastic ratchet and tethered filaments. *Biophys. J.*, **84**: 1591-1605 (2003).
- [38] J. M. Scholey, I. Brust-Mascher, A. Mogilner, Cell division. *Nature*, **422**: 746-752 (2003).
- [39] M. Luca, A. Chavez-Ross, L. Edelstein-Keshet, A. Mogilner, Chemotactic signaling, microglia, and Alzheimer's disease senile plaques: is there a connection? *Bull. Math. Biol.*, **65**: 693-730 (2003).
- [40] A. Mogilner, L. Edelstein-Keshet, L. Bent, A. Spiros, Mutual interactions, potentials, and individual distance in a social aggregation. *J. Math. Biol.*, **47**: 353-389 (2003).

- [41] A. Mogilner, G. Oster, Polymer Motors: Pushing out the Front and Pulling up the Back. *Curr. Biol.*, **13**: R721-R733 (2003).
- [42] H. P. Grimm, A. B. Verkhovsky, A. Mogilner, J.-J. Meister, Analysis of Actin Dynamics at the Leading Edge of Crawling Cells: Implications for the Shape of Keratocyte Lamellipodia. *Eur. Biophys. J.*, **32**: 563-577 (2003).
- [43] A. Mogilner, G. Oster, Shrinking Gels Pull Cells. *Science*, **302**: 1340-1341 (2003).
- [44] B. C. Mazzag, I. B. Zhulin, A. Mogilner, Model of bacterial band formation in aerotaxis. *Biophys. J.*, **85**: 3558-3574 (2003).
- [45] C. Wolgemuth, A. Mogilner, G. Oster, The hydration dynamics of poly-electrolyte gels with applications to drug delivery and cell motility. *Eur. Biophys. J.*, **33**: 146-158 (2004).
- [46] E. Cytrynbaum, V. Rodionov, A. Mogilner, Computational model of dynein-dependent self-organization of microtubule asters. *J. Cell Sci.*, **117**: 1381-1397 (2004).
- [47] I. Brust-Mascher, G. Civelekoglu-Scholey, M. Kwon, A. Mogilner and J. M. Scholey, Model for anaphase B: Role of three mitotic motors in a switch from poleward flux to spindle elongation *PNAS*, **101**: 15938-15943 (2004).
- [48] I. L. Novak, B. M. Slepchenko, A. Mogilner, L. M. Loew, Cooperativity between cell contractility and adhesion, *Phys. Rev. Lett.*, **93**: 268109 (2004).
- [49] G. Civelekoglu-Scholey, A. Wayne Orr, I. Novak, J.-J. Meister, M.A. Schwartz, A. Mogilner, Model of Coupled Transient Changes of Rac, Rho, Adhesions and Stress Fibers Alignment in Endothelial Cells Responding to Shear Stress, *J. Theor. Biol.*, **232**: 569-585 (2005).
- [50] B. Rubinstein, K. Jacobson, A. Mogilner, Multiscale Two-Dimensional Modeling of a Motile Simple-Shaped Cell. *SIAM J. MMS*, **3**: 413-439 (2005).
- [51] R. Wollman, E. N. Cytrynbaum, J. T. Jones, T. Meyer, J.M. Scholey, A. Mogilner, Efficient chromosome capture requires a bias in the "Search-and-Capture" process during mitotic spindle assembly. *Curr. Biol.*, **15**: 828-832 (2005).
- [52] G. Oster, A. Mogilner, Force generation by cellular polymers, in *Supramolecular Polymers*, 2nd edition, A. Ciferri, Ed., CRC Press, pp. 741-752 (2005).
- [53] A. Mogilner and B. Rubinstein, The Physics of Filopodial Protrusion, *Biophys. J.*, **89**: 782-795 (2005).

- [54] E. N. Cytrynbaum, P. Sommi, I. Brust-Mascher, J.M. Scholey, A. Mogilner, Early Spindle Assembly in *Drosophila* Embryos: Role of a Force-balance Involving Cytoskeletal Dynamics and Nuclear Mechanics, *Mol. Biol. Cell*, **16**: 4967-4981 (2005).
- [55] V. Malikov, E. N. Cytrynbaum, A. Kashina, A. Mogilner, V. Rodionov, Centering of a radial microtubule array by translocation along microtubules spontaneously nucleated in the cytoplasm, *Nature Cell Biol.*, **7**: 1213-1218 (2005).
- [56] A. Mogilner, On the Edge: Modeling Protrusion, *Curr. Opin. Cell Biol.*, **18**: 32-39 (2006).
- [57] S. Bohnet, R. Ananthakrishnan, A. Mogilner, J.-J. Meister, A. Verkhovsky, Weak force stalls protrusion at the leading edge of the lamellipodium, *Biophys. J.*, **90**: 1810-1820 (2006).
- [58] A. Mogilner, R. Wollman, G. Civelekoglu-Scholey, J. Scholey, Modeling Mitosis, *Trends Cell Biol.*, **16**: 88-96 (2006).
- [59] G. Civelekoglu-Scholey, D. J. Sharp, A. Mogilner, J. Scholey, Model of chromosome motility in *Drosophila* embryos: Adaptation of a general mechanism for rapid mitosis, *Biophys. J.*, **90**: 3966-3982 (2006).
- [60] A. Gallegos, B. Mazzag, A. Mogilner, Two continuum models for the spreading of myxobacteria swarms, *Bull. Math. Biol.*, **68**:837-861 (2006).
- [61] M. Karakozova, M. Kozak, C. C. L. Wong, A. Bailey, A. Mogilner, J. Yates, A. Kashina, Arginylation of beta actin regulates actin cytoskeleton and cell motility, *Science*, **313**: 192-196 (2006).
- [62] E. Cytrynbaum, V. Rodionov, A. Mogilner, Nonlocal mechanism of self-organization and centering of microtubule asters, *Bull. Math. Biol.*, **68**: 10531072 (2006).
- [63] A. Mogilner, R. Wollman, W. Marshall, Quantitative modeling in cell biology: what is it good for?, *Dev. Cell*, **11**: 279-287 (2006).
- [64] M. Prass, K. Jacobson, A. Mogilner, M. Radmacher, Direct measurement of the lamellipodial protrusive force in migrating cell, *J. Cell Biol.*, **174**: 767-772 (2006).
- [65] K. Larripa, A. Mogilner, Transport of a 1D viscoelastic actin-myosin strip of gel as a model of a crawling cell, *Physica A*, **372**: 113-123 (2006).
- [66] X. Pan, G. Ou, G. Civelekoglu-Scholey, O. E. Blacque, N. F. Endres, L. Tao, A. Mogilner, M. R. Leroux, R. D. Vale, J. M. Scholey, Mechanism of transport of IFT-particles in *C. elegans* cilia by the concerted action of kinesin-II and OSM-3 motors, *J. Cell Biol.*, **174**: 1035-1045 (2006).

- [67] L. Tao, A. Mogilner, G. Civelekoglu-Scholey, R. Wollman, J. Evans, H. Stahlberg, J. M. Scholey, The homotetrameric kinesin-5, KLP61F, forms crossbridges between Microtubules and antagonizes Ncd in Motility Assays, *Curr. Biol.*, **16**: 2293-2302(2006).
- [68] D. K. Cheerambathur, G. Civelekoglu-Scholey, I. Brust-Mascher, P. Sommi, A. Mogilner, J. M. Scholey, Quantitative analysis of an anaphase B switch: predicted role for a microtubule catastrophe gradient. *J. Cell Biol.*, **177**: 995-1004 (2007).
- [69] C. I. Lacayo, Z. Pincus, M. M. VanDuijn, C. A. Wilson, D. A. Fletcher, F. B. Gertler, A. Mogilner, J. A. Theriot, Emergence of Large-Scale Cell Morphology and Movement from Local Actin Filament Growth Dynamics, *PLOS Biology*, **5**: e233 (2007).
- [70] M. M. Kozlov, A. Mogilner, Model of polarization and bi-stability of cell fragments, *Biophys. J.*, **93**: 1-9 (2007).
- [71] J. Fass, C. Pak, J. Bamberg, A. Mogilner, Stochastic Simulation of Actin Dynamics Reveals the Role of Annealing and Fragmentation, *J. Theor. Biol.*, **252**: 173-183 (2008).
- [72] R. Wollman, G. Civelekoglu-Scholey, J. M. Scholey, A. Mogilner, Reverse engineering of force integration during mitosis in the *Drosophila* embryo, *Mol. Syst. Biol.*, **4**: 195 (2008).
- [73] K. Keren, Z. Pincus, G. M. Allen, E. L. Barnhart, G. Marriott, A. Mogilner, J. A. Theriot, Mechanism of shape determination in motile cells, *Nature*, **453**: 475-480 (2008).