

CURRICULUM VITAE

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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

2014-present: New York University:

Professor, Courant Institute and Department of Biology.

2002-2014: University of California, Davis:

Professor of Mathematics and Neurobiology.

1999-2002: University of California, Davis:

Associate Professor of Mathematics.

1996-1999: University of California, Davis:

Assistant Professor of Mathematics.

1995-96: University of California, Berkeley:

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

2010 – 2013: Mechanobiology Institute, National University of Singapore.

2009: National Center for Biological Sciences, Bangalore, India.

2001, 2004: Isaak Newton Institute for Mathematical Sciences, Cambridge.

2000: University of Utah, Department of Mathematics.

4 Awards, fellowships, grants

Current:

US Army Office of Research grant ‘Mathematics of collective cell migration in electric field, PI, 2017-2020.

NIH grant ‘Sizing and Scaling in Functional Muscle Cells, Co-PI, 2017-2022.

ARC (Australian Research Council) grant ‘How motor proteins contract the cell cortex and form a cell division ring, Co-PI, 2017-2022.

BSF (United States- Israel Binational Science Foundation) grant ‘Lamellipodial fragments as a model system for cell motility’, Co-PI, 2010-2019.

5 Awards, honors, fellowships, grants

Past support:

NIH RO1 grant NIGMS GM068952 ‘Mechanics of lamellipodial stability, turning and self-polarization’. PI, 2011-2016.

NIH RO1 grant NIGMS GM068952-01 ‘Dynamics of Mitotic Spindle Morphogenesis’. PI, 2003-2011.

NSF Grants DMS 9707750, 1097749, 0315782, 0715729, 1118206 on mathematical models of cellular movements and mitotic spindle. PI, 1997-2015.

NIH GLUE grant ‘Cell Migration Consortium’. Co-PI, 2001-2011.

DiPrima Lecturer, Rensselaer Polytechnic Institute, 2013.

Chancellor’s Fellowship, University of California, Davis, 2000-2005.

Fellowship in Math and Mol Biol, Univ of California, Berkeley, 1995-96.

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

6 Conferences

6.1 Recent invited talks at the conferences

1. Annual Meeting of the Biophysical Society of Canada (June 1-3, 2016, Winnipeg)

Plenary talk: Mechanisms of Spontaneous and Induced Motility Initiation.

2. Gordon Research Conference on Signaling by Adhesion Receptors (June 3, 2016, Bates College)

Talk: Cell Motility from 2D to 3D.

4. International Conference ‘Biological Active Matter (March 20-23, 2017, New York)

Talk: Multiple nuclei positioning and scaling in muscle cells.

5. Jacques Monod Conference (8-12 May, 2017, Roscoff, France)

Talk: Multiple nuclei positioning and scaling in muscle cells.

6. The International Workshop on Cell Migration (12-14 June, 2017, Porto Alegre, Brazil)

Talk: Design principles of actin treadmill.

7. 9th IUPAP International Conference on Biological Physics (5-9 June, 2017, Rio de Janeiro, Brazil)
Talk: Cell migration as a free boundary problem.
8. NSF Workshop ‘FINDING YOUR INNER MODELER’(13 July, 2017, Chicago)
Talk: Positioning and size scaling of nuclei in multinucleated muscle cells.
9. Conference ‘Organization and Dynamics of Living Systems’(25-30 September, 2017, Corsica)
Talk: Positioning and size scaling of nuclei in multinucleated muscle cells.
11. Workshop ‘PDE Models of Motility and Invasion in Active Biosystems’(22-38 October, 2017, Oberwolfach)
Talk: Cell motility as a free boundary problem.

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

1. Organizer of the international meeting “Computational cell biology” at Cold Spring Harbor (March 24-27, 2009).
2. Organizer of the international meeting “From Motors to Morphogenesis” at Berkeley (May 30-31, 2009).
3. Teacher of the “Applied Mathematics and Modeling” course at Math Dept, National University of Laos (August, 2009)
4. Organizer of the mini-symposium “Cell Migration” at Annual Meeting of the American Society for Cell Biology, Denver (December 7-10, 2011)
5. Lecturer at the summer school ‘Quantitative Physics-Based Multiscale Modeling of Biological Processes’. Porto Allegre, Brazil (July 14-20, 2013)
6. Organizer of the International Workshop ‘Mathematics of the Cell: Integrating Genes, Biochemistry and Mechanics’. Banff, Canada (September 7-12, 2014)
7. Lecturer at the summer schools ‘Modelling Cellular system in Space and Time’. Porquerolles, France (October 5-11, 2014 and October 19-26, 2016)
8. Lecturer at the EMBO practical course ‘Multilevel Modelling of Morphogenesis. John Innes Centre, Norwich, UK (July 16-24, 2017)

7 Professional activities

- Editorial Board Member: Cell, Molecular Biology of the Cell, Journal of Cell Biology, Bulletin of Mathematical Biology.
- Chair of NIH panel ”Modeling and Analysis of Biological Systems” (2008-2010)

Selected Publications (out of 132)

- [1] 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).
- [2] 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).
- [3] A.Mogilner, L.Edelstein-Keshet, Spatio-angular order in populations of self-aligning objects: formation of oriented patches, *Physica D*, **89**: 346-367 (1996).
- [4] A. Mogilner, G.Oster, Cell motility driven by actin polymerization, *Biophysical Journal*, **71**: 3030-3045 (1996).
- [5] A. Mogilner, G.Oster, The physics of lamellipodial protrusion, *European Biophysics Journal*, **25**: 47-53 (1996).
- [6] H.-Y. Wang, T. Elston, A. Mogilner, G.Oster, Force generation in RNA Polymerase, *Biophysical Journal*, **74**: 1186-1202 (1998).
- [7] 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).
- [8] A. Mogilner, G.Oster, The polymerization ratchet model explains the force-velocity relation for growing microtubules, *European Biophysics Journal*, **28**: 235-242 (1999).
- [9] A.Mogilner, L.Edelstein-Keshet, A non-local model for a swarm, *Journal of Mathematical Biology*, **38**: 534-570 (1999).
- [10] 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).
- [11] D. Bottino, A. Mogilner, T. Roberts, M. Stewart, G. Oster, How nematode sperm crawl. *J. Cell Science*, **115**: 367-384 (2002).
- [12] A. Mogilner, L. Edelstein-Keshet, Regulation of Actin Dynamics in Rapidly Moving Cells: A Quantitative Analysis. *Biophys. J.*, **83**: 1237-1258 (2002).
- [13] E. Cytrynbaum, J. Scholey, A. Mogilner, A force balance model of early spindle pole separation in Drosophila Embryos. *Biophys. J.*, **84**: 757-769 (2003).
- [14] A. Mogilner, G. Oster, Force generation by actin polymerization II: The elastic ratchet and tethered filaments. *Biophys. J.*, **84**: 1591-1605 (2003).

- [15] J. M. Scholey, I. Brust-Mascher, A. Mogilner, Cell division. *Nature*, **422**: 746-752 (2003).
- [16] 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).
- [17] A. Mogilner, G. Oster, Polymer Motors: Pushing out the Front and Pulling up the Back. *Curr. Biol.*, **13**: R721-R733 (2003).
- [18] A. Mogilner, G. Oster, Shrinking Gels Pull Cells. *Science*, **302**: 1340-1341 (2003).
- [19] E. Cytrynbaum, V. Rodionov, A. Mogilner, Computational model of dynein-dependent self-organization of microtubule asters. *J. Cell Sci.*, **117**: 1381-1397 (2004).
- [20] 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).
- [21] I. L. Novak, B. M. Slepchenko, A. Mogilner, L. M. Loew, Cooperativity between cell contractility and adhesion, *Phys. Rev. Lett.*, **93**: 268109 (2004).
- [22] B. Rubinstein, K. Jacobson, A. Mogilner, Multiscale Two-Dimensional Modeling of a Motile Simple-Shaped Cell. *SIAM J. MMS*, **3**: 413-439 (2005).
- [23] 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).
- [24] A. Mogilner and B. Rubinstein, The Physics of Filopodial Protrusion, *Biophys. J.*, **89**: 782-795 (2005).
- [25] 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).
- [26] 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).
- [27] A. Mogilner, On the Edge: Modeling Protrusion, *Curr. Opin. Cell Biol.*, **18**: 32-39 (2006).

- [28] A. Mogilner, R. Wollman, G. Civelekoglu-Scholey, J. Scholey, Modeling Mitosis, *Trends Cell Biol.*, **16**: 88-96 (2006).
- [29] A. Mogilner, R. Wollman, W. Marshall, Quantitative modeling in cell biology: what is it good for?, *Dev. Cell*, **11**: 279-287 (2006).
- [30] 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).
- [31] 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).
- [32] M. M. Kozlov, A. Mogilner, Model of polarization and bi-stability of cell fragments, *Biophys. J.*, **93**: 1-9 (2007).
- [33] 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).
- [34] 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).
- [35] Choi CK, Vicente-Manzanares M, Zareno J, Whitmore LA, Mogilner A, Horwitz AF. Actin and alpha-actinin orchestrate the assembly and maturation of nascent adhesions in a myosin II motor-independent manner. *Nat. Cell Biol.*, **10**: 1039-1050 (2008).
- [36] A. Mogilner, Mathematics of cell motility: have we got its number? *J Math Biol.*, **58**: 105-134 (2009).
- [37] Keren K, Yam PT, Kinkhabwala A, Mogilner A, Theriot J. Intracellular fluid flow in rapidly moving cells, *Nature Cell Biol.*, **11**: 1219-1224 (2009).
- [38] Raja Paul, Roy Wollman, William T. Silkworth, Isaac K. Nardi, Daniela Cimini, Alex Mogilner. Computer simulations predict that chromosome movements and rotations accelerate mitotic spindle assembly without compromising accuracy, *PNAS*, **106**: 15708-1513 (2009).
- [39] Mogilner A., Keren K. The shape of motile cells, *Curr Biol.*, **19**: R762-R771 (2009).
- [40] M J Dayel, O Akin, M Landeryou, V I Risca, A Mogilner, R D Mullins, In Silico Reconstitution of Actin-Based Symmetry Breaking and Motility, *PLoS Biology*, **7**:e1000201 (2009).

- [41] B. Rubinstein, M. F. Fournier, K. Jacobson, A. Verkhovsky, A. Mogilner
Actin-myosin viscoelastic flow in the keratocyte lamellipod, *Biophys. J.*,
97: 1853-1863 (2009).
- [42] A. Mogilner, E. Craig, Toward a quantitative understanding of mitotic-
spindle assembly and mechanics, *J Cell Sci.*, **123**: 3435-3445 (2010).
- [43] J. Zhu, A. Burakov, V. Rodionov, A. Mogilner. Finding the cell center by
a balance of dynein and myosin pulling and microtubule pushing: compu-
tational study. *Mol. Biol. Cell*, **21**: 4418-4427 (2010).
- [44] Barnhart EL, Lee K-C, Keren K, Mogilner A, Theriot JA (2011) An Adhesion-
Dependent Switch between Mechanisms That Determine Motile Cell Shape.
PLoS Biol **9**: e1001059. (2011).
- [45] Valentin Magidson, Christopher B. OConnell, Raja Paul, Jadranka Lonarek,
Alex Mogilner and Alexey Khodjakov Spatial arrangement of chromo-
somes during prometaphase accelerates spindle assembly. *Cell*, **146**: 555-
567 (2011).
- [46] Charles W. Wolgemuth, Jelena Stajic, and Alex Mogilner, Redundant
mechanisms for stable cell locomotion revealed by minimal models. *Bio-
phys J* **101**: 545-553 (2011).
- [47] Ambarish Kunwar, Suvranta K. Tripathy, Jing Xu, Michelle Mattson, Roby
Sigua, Richard McKinney, Clare Yu,3, Alex Mogilner, and Steven P.
Gross, Mechanical stochastic tug-of-war models cannot explain bidirec-
tional lipid-droplet transport. *PNAS*, **108**: 18960-18965 (2011).
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21: 692-700 (2011).
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mines Shape and Speed of Lamellipodial Fragments. *PNAS*, **108**: 20394-
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- [50] William T. Silkworth, Isaac K. Nardi, Raja Paul, Alex Mogilner, Daniela
Cimini, Timing of centrosome separation is important for accurate chro-
mosome segregation. *Mol. Biol. Cell* **23**: 401-411 (2012).
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Matthew J. Footer, Frederick S. Soo, Yu Lu, Younan Xia, Alexander
Mogilner, and Julie A. Theriot, Choosing Orientation: Influence of Cargo
Geometry and ActA Polarization on Actin Tails. *Mol. Biol. Cell* **23**:
614-629 (2012)
- [52] Vinogradova T, Paul R, Grimaldi AD, Loncarek J, Miller PM, Yampolsky
D, Magidson V, Khodjakov A, Mogilner A, Kaverina I., Concerted effort of
centrosomal and Golgi-derived microtubules is required for proper Golgi
complex assembly but not maintenance. *Mol. Biol. Cell* **23**: 820-833
(2012).

- [53] Alex Mogilner, Jun Allard and Roy Wollman. Cell polarity: Quantitative modeling as a tool in cell biology. *Science*. **336**: 175-179 (2012).
- [54] Jonathan N. Thon, Hannah Macleod, Antonija Jurak Begonja, Jie Zhu, Kun-Chun Lee, Alex Mogilner, John H. Hartwig, Joseph E. Italiano Jr. Microtubule and cortical forces determine platelet size during vascular platelet production. *Nat. Commun.* **3**: 852 (2012).
- [55] Jie Zhu, Alex Mogilner, Mesoscopic Model of Actin-Based Propulsion. *PLoS Comp Biol*, **8** (11) e1002764 (2012).
- [56] Jun Allard and Alex Mogilner. Traveling waves in actin dynamics and cell motility. *Cur Opin Cell Biol*, **25**: 107-115 (2013).
- [57] Yaohui Sun, Hao Do, Jing Gao, Ren Zhao, Min Zhao, Alex Mogilner. Keratocyte fragments and cells utilize competing pathways to move in opposite directions in an electric field. *Cur Biol*, **23**: 569-574 (2013).
- [58] Greg M. Allen, Alex Mogilner, Julie A. Theriot. Electrophoresis of cellular membrane components creates the directional cue guiding keratocyte galvanotaxis. *Cur Biol*, **23**: 560-568 (2013).
- [59] Weiwei Luo, Cheng-han Yu, Zi Zhao Lieu, Jun Allard, Alex Mogilner, Michael P. Sheetz and Alexander Bershadsky, Analysis of the global organization and dynamics of cytoplasmic actin networks *J Cell Biol*, **202**: 1057-1073 (2013).
- [60] Gaudenz Danuser, Jun Allard and Alex Mogilner. Mathematical modeling of eukaryotic cell migration: insights beyond experiments. *Ann. Rev. Cell Dev. Biol.*, **29**: 501-528 (2013).
- [61] Erin L. Barnhart, Kun-Chun Lee, Greg M. Allen, Julie A. Theriot, Alex Mogilner The balance between cell-substrate adhesion and myosin contraction determines the frequency of motility initiation in fish keratocytes. *PNAS*, **112**: 5045-50 (2015).
- [62] Valentin Magidson, Raja Paul, Nachen Yang, Jeffrey Ault, Christopher O'Connell, Bruce McEwen, Alex Mogilner, and Alexey Khodjakov. Adaptive changes in the kinetochore architecture facilitate proper spindle assembly *Nat Cell Biol*, **17**: 1134-44 (2015).
- [63] Alexis J. Lomakin, Kun-Chun Lee, Sangyoon J. Han, Amy Bui, Michael Davidson, Alex Mogilner, Gaudenz Danuser. Competition of two distinct actin networks for actin defines a bistable switch for cell polarization. *Nat Cell Biol*, **17**:1435-45 (2015).
- [64] Charlotte Guetta-Terrier, Hongyan Long, Pascale Monzo, Jie Zhu, Chew Sing Yian, Alexander Mogilner, Benoit Ladoux, Nils C. Gauthier. Protrusive Waves Guide 3D Cell Migration along Nanofibers. *J Cell Biol*, **211**: 683-701 (2015).

- [65] D. Oelz, B. Rubinstein and A. Mogilner. Contraction of random actomyosin arrays is enabled by the combined effect of actin treadmilling and crosslinking. *Biophys J*, **109**: 1818-29 (2015).
- [65] Zhu J, Mogilner A. Comparison of cell migration mechanical strategies in three-dimensional matrices: a computational study. *Interface Focus*, **6**: 20160040 (2016).
- [66] A. Mogilner and A. Manhart. Agentbased modeling: case study in cleavage furrow models. *Mol Biol Cell*, **27**: 3379-84 (2016).
- [67] Erin L. Barnhart, Jun Allard, Sunny S. Lou, Julie A. Theriot, Alex Mogilner. Adhesion-Dependent Wave Generation in Crawling Cells. *Cur Biol*, **27**: 112 (2017).
- [68] C. A. Copos, S. Walcott, J. C. del Alamo, E. Bastounis, A. Mogilner, R. D. Guy. Mechanosensitive adhesion explains stepping motility in amoeboid cells. *Biophys J*, **112**: 267282 (2017).
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