

# Curriculum Vitae

## Karen E. Kasza

Clare Boothe Luce Assistant Professor of Mechanical Engineering  
Affiliate Assistant Professor of Biomedical Engineering  
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## Education

Harvard University	Ph.D., Applied Physics	2010
Harvard University	M.A., Applied Physics	2005
University of Chicago	B.A., Physics	2003

## Academic Positions

Columbia University Mechanical Engineering	Assistant Professor	01/2016	present
Columbia University Biomedical Engineering	Affiliated Assistant Professor	07/2017	present
Memorial Sloan Kettering Cancer Center	Postdoctoral Fellow	01/2010	12/2015

## Awards and Honors

Packard Fellowship for Science and Engineering	2018-2023
NSF CAREER Award	2018-2023
Columbia Provost's Grant for Junior Faculty Who Contribute to the Diversity Goals of the University	2017-2018
Clare Boothe Luce Assistant Professorship	2016-2021
Burroughs Wellcome Fund Career Award at the Scientific Interface	2014-2019
Helen Hay Whitney Foundation Postdoctoral Fellowship	2011-2014
National Science Foundation Graduate Fellowship	2007-2009
National Defense Science and Engineering Fellowship	2004-2007
University of Chicago Student Marshal	2003
Argonne National Laboratory-University of Chicago Scholarship	1999-2003

## Principal Fields of Interest

mechanics of morphogenesis, mechanobiology, biomechanics, developmental biology,  
soft materials

## Publications

(underline, students or postdocs supervised)

### Papers in Refereed Journals (Chronological Order)

- J1. Ladavac K, **Kasza K**, Grier DG. Sorting mesoscopic objects with periodic potential landscapes: optical fractionation. *Physical Review E*. 70(1 Pt 1):010901, 2004.
- J2. Kaufman LJ, Brangwynne CP, **Kasza KE**, Filippidi E, Gordon VD, Deisboeck TS, Weitz DA. Glioma expansion in collagen I matrices: analyzing collagen concentration-dependent growth and motility patterns. *Biophysical Journal*. 89(1):635-50, 2005.
- J3. Liu J, Koenderink GH, **Kasza KE**, Mackintosh FC, Weitz DA. Visualizing the strain field in semiflexible polymer networks: strain fluctuations and nonlinear rheology of F-actin gels. *Physical Review Letters*. 98(19):198304, 2007.
- J4. **Kasza KE**, Rowat AC, Liu J, Angelini TE, Brangwynne CP, Koenderink GH, Weitz DA. The cell as a material. (Review) *Current Opinion in Cell Biology*. 19(1):101-107, 2008.
- J5. Nakamura F, Heikkinen O, Pentikäinen OT, Osborn TM, **Kasza KE**, Weitz DA, Kupiainen O, Permi P, Kilpeläinen I, Ylännä J, Hartwig JH, Stossel TP. Molecular Basis of Filamin A-FilGAP Interaction and Its Impairment in Congenital Disorders Associated with Filamin A Mutations. *PLoS ONE*. 4(3):e4928, 2009.
- J6. Huang F, Rotstein R, Fraden S, **Kasza KE**, Flynn NT. Phase behavior and rheology of attractive rod-like particles. *Soft Matter*. 5(14), 2766 – 2771, 2009.
- J7. **Kasza KE**, Nakamura F, Hu S, Kollmannsberger P, Bonakdar N, Fabry B, Stossel TP, Wang N, Weitz DA. Filamin A is essential for active cell stiffening but not passive stiffening under external force. *Biophysical Journal*. 96(10):4326-35, 2009.
- J8. **Kasza KE**, Koenderink GH, Lin YC, Broedersz CP, Messner W, Nakamura F, Stossel TP, MacKintosh FC, Weitz DA. Nonlinear elasticity of stiff biopolymers connected by flexible linkers. *Physical Review E*. 79(4 Pt 1):041928, 2009.
- J9. Broedersz CP, **Kasza KE**, Jawerth LM, Münster S, Weitz DA, MacKintosh FC. Measurement of nonlinear rheology of cross-linked biopolymer gels. *Soft Matter*. 6(17): 4120-4127, 2010.
- J10. Yao NY, Broedersz CP, Lin YC, **Kasza KE**, Mackintosh FC, Weitz DA. Elasticity in ionically cross-linked neurofilament networks. *Biophysical Journal*. 98(10):2147-53, 2010.
- J11. **Kasza KE**, Broedersz CP, Koenderink GH, Lin YC, Messner W, Millman EA, Nakamura F, Stossel TP, Mackintosh FC, Weitz DA. Actin filament length tunes elasticity of flexibly cross-linked actin networks. *Biophysical Journal*. 99(4):1091-1100, 2010.
- J12. **Kasza KE**, Zallen JA. Dynamics and regulation of contractile actin-myosin networks in morphogenesis. (Review) *Current Opinion in Cell Biology*. 23(1):30-8, 2011.
- J13. **Kasza KE**, Farrell DL, Zallen JA. Spatiotemporal control of epithelial remodeling by regulated myosin phosphorylation. *Proceedings of the National Academy of Sciences USA*. 111(32):11732, 2014.
- J14. Guo M, Pegoraro AF, Mao A, Zhou EH, Arany PR, Han Y, Burnette DT, Jensen MH, **Kasza KE**, Moore JR, Mackintosh FC, Fredberg JJ, Mooney DJ, Lippincott-Schwartz J, Weitz DA. Cell volume change through water efflux impacts cell stiffness and stem cell fate. *Proceedings of the National Academy of Sciences USA*. 114(41):E8618, 2017.
- J15. Aksit A, Arteaga DN, Arriaga M, Wang X, Watanabe H, **Kasza KE**, Lalwani AK, Kysar JW. In-vitro perforation of the round window membrane via direct 3-D printed microneedles. *Biomedical microdevices*. 20(2):47, 2018.

- J16. Herrera-Perez RM and **Kasza KE**. Biophysical control of the cell rearrangements and cell shape changes that build epithelial tissues. *Current Opinion in Genetics & Development*, 51, 88-95, 2018.

### **Books and Chapters in Books**

- B1. Gardel ML, **Kasza KE**, Brangwynne CP, Liu J, Weitz DA. Mechanical response of cytoskeletal networks, in *Methods in Cell Biology, Biophysical Tools for Biologists, Volume Two: In Vivo Techniques*, D. J. J. Correia and H. William Detrich III eds., Academic Press, 89:487 – 519, 2008.
- B2. **Kasza KE**, Vader D, Köster S, Wang N, Weitz DA. Imaging techniques for measuring the materials properties of cells, in *Live Cell Imaging, 2nd Edition*, D. Spector, J. Swedlow, and R. Goldman eds., Cold Spring Harbor Laboratory Press, 2009.
- B3. **Kasza KE** and Weitz DA. Mechanical Properties of Actin Networks, in *Comprehensive Biophysics, 1st Edition, Volume Four*, E. Egelman ed., Academic Press, 2012.

### **Presentations at Refereed Conferences (Chronological Order)**

- C1. **Kasza KE** and Weitz DA, *The actin cross-linker filamin plays a key role in the nonlinear mechanical response of living cells*, Conference presentation at the 5th World Congress of Biomechanics, Munich, Germany, July 29-Aug 4, 2006.
- C2. **Kasza KE** and Weitz DA, *Actin-Filamin Networks and Cell Mechanics*, Conference presentation at the American Physical Society March Meeting, Denver, CO, March 5-9, 2007.
- C3. **Kasza KE** and Zallen JA, *Mechanical regulation of myosin II in morphogenesis*, Conference poster presentation at Mathematical Biology of the Cell: Cytoskeleton and Motility Workshop at the Banff International Research Station, Banff, Canada, July 31-Aug 5, 2011.
- C4. **Kasza KE** and Zallen JA, *Mechanical regulation of motor proteins in animal morphogenesis*, Conference poster presentation at the 6th Gotham-Metro Condensed Matter Meeting, The New York Academy of Sciences, November 11, 2011.
- C5. **Kasza KE** and Zallen JA, *Mechanical regulation of myosin II in morphogenesis*, Conference poster presentation at the Morphogenesis and Dynamics of Multicellular Systems Workshop, EMBL Heidelberg, Germany, September 7-9, 2012.
- C6. **Kasza KE** and Zallen JA, *Mechanical regulation of myosin II in morphogenesis*, Conference poster presentation at the Evolution of Colloidal Matter Conference, Center for Soft Matter Research, New York University, June 27-29, 2013.
- C7. **Kasza KE**, Farrel DL, and Zallen JA, *Myosin II regulation and activity provide spatial and temporal control of the forces that shape tissues*, Conference poster presentation at the American Society for Cell Biology, Annual Meeting. Philadelphia, PA, December 6-8, 2014.
- C8. Wang X and **Kasza KE**, *Mechanics and Morphogenesis of Epithelial Tissues*, Conference poster presentation at the Northeast Complex Fluids and Soft Matter Workshop (NCS7), Princeton, NJ, May 26, 2017.
- C9. **Kasza KE**, *Force Generation within Tissues During Embryo Development*, Conference presentation at the SEM Annual Conference on Experimental and Applied Mechanics, Indianapolis, IN, June 12-15, 2017.

- C10. Herrera-Perez RM and **Kasza KE**, *Spatiotemporal control of contractile forces in Drosophila using optogenetic tools*, Conference poster presentation at the Gordon Research Conference on Motile and Contractile Systems, New London, NH, July 30 - August 4, 2017.
- C11. Wang X and **Kasza KE**, *Systematically modulating cell-cell adhesion reveals cellular mechanisms of epithelial remodeling in Drosophila*, Conference poster presentation at the American Society for Cell Biology Annual Meeting, Philadelphia, PA, December 1-5, 2017.
- C12. Wang X and **Kasza KE**, *The role of cell-cell adhesion in epithelial tissue remodeling*. Conference presentation at the 8<sup>th</sup> Northeast Complex Fluids and Soft Matter Meeting, Columbia University, New York, NY, January 12, 2018.
- C13. Herrera-Perez RM and **Kasza KE**, *Optogenetic control of cell contractility during epithelial morphogenesis in Drosophila*. Conference presentation at the Genetics Society of America Annual *Drosophila* Research Conference, Philadelphia, PA, April 11-15, 2018.
- C14. Wang X and **Kasza KE**, *Cell-cell adhesion in tissue mechanics*. Conference presentation at the 9<sup>th</sup> Northeast Complex Fluids and Soft Matter Meeting, University of Pennsylvania, Philadelphia, PA, May 25, 2018.
- C15. **Kasza KE** and Herrera-Perez RM, *Controlling where and when forces are generated during tissue morphogenesis*. Conference presentation at the SEM Annual Conference on Experimental and Applied Mechanics, Greenville, South Carolina USA, June 4-7, 2018.
- C16. **Kasza KE** and Herrera-Perez RM, *Controlling where and when forces are generated during tissue morphogenesis*. Conference presentation at the 8<sup>th</sup> World Congress of Biomechanics, Dublin, Ireland, July 8-12, 2018.
- C17. Wang X and **Kasza KE**, *Systematically modulating cell-cell adhesion in vivo reveals mechanics of epithelial tissue morphogenesis*. Conference presentation at the 8<sup>th</sup> World Congress of Biomechanics, Dublin, Ireland, July 8-12, 2018.
- C18. Wang X and **Kasza KE**, *The role of cell-cell adhesion in tissue mechanics and morphogenesis*. Conference presentation at the 77<sup>th</sup> New England Complex Fluids Meeting, Harvard University, Cambridge, MA, November 30, 2018.
- C19. Wang X and **Kasza KE**, *The role of cell-cell adhesion in tissue mechanics and morphogenesis*. Conference presentation at the 10<sup>th</sup> Northeast Complex Fluids and Soft Matter Workshop, Rutgers University, New Brunswick, NJ, January 23, 2019.
- C20. Zhang R and **Kasza KE**, *Coordination of cell-cell adhesion and contractility during tissue remodeling*. Conference presentation at the 10<sup>th</sup> Northeast Complex Fluids and Soft Matter Workshop, Rutgers University, New Brunswick, NJ, January 23, 2019.
- C21. Herrera-Perez RM and **Kasza KE**, *Optogenetic control of contractile forces during Drosophila morphogenesis*, Conference presentation at the American Physical Society March Meeting, Boston, MA, March 4-8, 2019.
- C22. Wang X and **Kasza KE**, *Cell-cell adhesion in tissue mechanics and morphogenesis*, Conference presentation at the American Physical Society March Meeting, Boston, MA, March 4-8, 2019.

### Invited Talks (Chronological Order)

1. November 3, 2006, *Mechanics of Crosslinked Actin Networks and the Cell*, Mechanical Science and Engineering Department, University of Illinois at Urbana-Champaign, Bio-Interest Group Seminar.
2. April 20, 2009, *Polymer physics of a reconstituted cell cytoskeleton*, Physics Department Seminar. Mount Holyoke College. Mt. Holyoke, MA.

3. March 20, 2013, *Myosin II Dynamics during Embryo Morphogenesis*, American Physical Society, Annual March Meeting. Baltimore, MD.
4. December 14, 2013, *Control of the myosin-generated forces that shape tissues by genetically altered myosin activity*, American Society for Cell Biology, Annual Meeting. New Orleans, LA.
5. April 7, 2014, *Spatiotemporal control of the forces that shape tissues*, Biophysics Seminar Series. Princeton University. Princeton, NJ.
6. November 7, 2014, *Spatiotemporal control of the forces that shape tissues*, Condensed Matter & Biological Physics Seminar. Syracuse University. Syracuse, NY.
7. December 16, 2014, *Spatiotemporal control of the forces that shape tissues*, Biomedical Engineering/Biophysics/ Physics Stadtman Symposium. National Institutes of Health. Bethesda, MD.
8. January 12, 2015, *Spatiotemporal control of the forces that shape tissues*, Department of Developmental Biology Seminar, Washington University in St. Louis. St. Louis, MO.
9. January 19, 2015, *Spatiotemporal control of the forces that shape tissues*, Department of Biology Seminar, Dartmouth College. Hanover, NH.
10. February 2, 2015, *Spatiotemporal control of the forces that shape tissues*, Department of Biomedical Engineering Seminar, Boston University. Boston, MA.
11. February 5, 2015, *Spatiotemporal control of the forces that shape tissues*, Department of Physics Colloquium, Brandeis University. Waltham, MA.
12. February 10, 2015, *Spatiotemporal control of the forces that shape tissues*, Department of Physics Colloquium, Syracuse University. Syracuse, NY.
13. February 17, 2015, *Spatiotemporal control of the forces that shape tissues*, Department of Biomedical Engineering Seminar, Yale University. New Haven, CT.
14. February 19, 2015, *Spatiotemporal control of the forces that shape tissues*, Department of Mechanical Engineering Seminar, Columbia University. New York, NY.
15. February 26, 2015, *Spatiotemporal control of the forces that shape tissues*, Department of Biomedical Engineering Seminar, University of Michigan. Ann Arbor, MI.
16. March 2, 2015, *Spatiotemporal control of the forces that shape tissues*, Department of Mechanical Engineering Seminar, University of California. San Diego, CA.
17. March 5, 2015, *Spatiotemporal control of the forces that drive cell rearrangements within multicellular tissues*, American Physical Society, Annual March Meeting. San Antonio, TX.
18. March 9, 2015, *Spatiotemporal control of the forces that shape tissues*, Department of Physics Seminar, University of Colorado. Boulder, CO.
19. March 17, 2015, *Spatiotemporal control of the forces that shape tissues*, Department of Biology Seminar, McGill University. Montreal, Canada.
20. March 20, 2015, *Spatiotemporal control of the forces that shape tissues*, Department of Biomedical Engineering Seminar, Northwestern University. Evanston, IL.
21. April 9, 2015, *Spatiotemporal control of the forces that shape tissues*, Department of Biomedical Engineering Seminar, Cornell University. Ithaca, NY.
22. July 27, 2015, *Spatiotemporal control of the mechanical forces that shape tissues and embryos*, National Heart, Lung, and Blood Institute. National Institutes of Health. Bethesda, MD.
23. January 15, 2016, *Active forces that shape living tissues: building a fruit fly embryo*, Northeast Complex Fluids and Soft Matter Workshop, NYU Tandon School of Engineering. New York, NY.

24. March 28, 2016, *The forces that shape living tissues: building a fruit fly embryo*, Physics of Development and Disease Workshop, Aspen Center for Physics. Aspen, CO.
25. July 16, 2016, *Translating molecular-level force generation into tissue-level morphogenesis*, Developmental Mechanics Workshop, The Allied Genetics Conference. Orlando, FL.
26. September 12, 2016, *The forces that shape living tissues: building a fruit fly embryo*, Center for Neural Engineering and Computation Seminar Series, Columbia University. New York, NY.
27. December 5, 2016, *Multicellular tissue dynamics during morphogenesis*, Workshop on Adaptive Network Dynamics. UC Santa Barbara. Santa Barbara, CA.
28. March 16, 2017, *Force generation within tissues during development*, American Physical Society, Annual March Meeting. New Orleans, LA.
29. October 17-19, 2017, *Physical forces coordinating epithelial cell behaviors during morphogenesis*, Soft Matter Symposium on Biomedicine & Mechanics in Tissues, Cells, and their Microenvironments, University of Florida, Gainesville, FL.
30. February 21-23, 2018, *Physical forces coordinating epithelial cell behavior during morphogenesis*, Mechanics in Morphogenesis Workshop, Princeton Center for Theoretical Science, Princeton University, Princeton, NJ.
31. August 2-4, 2018, *Understanding and controlling where and when forces are generated during tissue morphogenesis*, Multi-Cellular Engineered Living Systems (M-CELS) Workshop, Q Center, St. Charles, IL.
32. September 19, 2018, *Controlling where and when forces are generated during tissue morphogenesis*. Mechanics: Modeling, Experimentation, Computation (MMEC) Seminar, MIT, Cambridge, MA.
33. October 23, 2018, *Mechanics of morphogenesis: spatiotemporal control of the forces that shape epithelial tissues*. 2nd International Symposium on Mechanomedicine: In Memory of Christopher R. Jacobs, Columbia University, New York, NY.
34. February 22, 2019. *Mechanics of morphogenesis: spatiotemporal control of the forces that shape epithelial tissues*. Mechanics Seminar Series, UW-Madison, Madison, WI.
35. March 28, 2019. *Controlling where and when mechanical forces are generated during tissue morphogenesis*. Department of Mechanical Engineering Colloquium Series, City College of New York, New York, NY.

## **Ph.D. Thesis**

1. Kasza KE, *Mechanics of the Actin Cytoskeleton*, Harvard University, 2010.

## **Patents**

1. Aberration correction of optical traps. Curtis JE, Koss BA, Grier DG, Ladavac K, Kasza K. US Patent Application 0080316575, Dec. 2008

## Teaching Experience

Spring 2016	Columbia	MECE E4100	Mechanics of fluids	Lecturer
Spring 2017	Columbia	MECE E4100	Mechanics of fluids	Lecturer
Fall 2017	Columbia	MEBM E4710	Morphogenesis: shape and structure in biological materials	Lecturer
Spring 2018	Columbia	MECE E4100	Mechanics of fluids	Lecturer
Fall 2018	Columbia	MECE E3100	Introduction to mechanics of fluids	Lecturer
Spring 2019	Columbia	MECE E4100	Mechanics of fluids	Lecturer

## Outreach Efforts

1. Faculty research mentor for two undergraduate women in engineering as part of a summer research opportunity through the J&J Scholars Program at Columbia University, 06/2017-09/2017.
2. Faculty research mentor for an undergraduate woman in engineering as part of a summer research opportunity through the J&J Scholars Program at Columbia University, 06/2018-09/2018.
3. Faculty research mentor for two under-represented minority high school students as part of a summer research opportunity through the E.N.G Program at Columbia University, 06/2018- 09/2018.

## Service

### Department of Mechanical Engineering, Columbia University

1. Coordinator, Department Seminar Series, 09/2016-08/2017
2. Member, Graduate Committee, 01/2016-present

## Other Professional Activities

### Journal Paper Reviewer

Proceedings of the National Academy of Sciences USA, Biophysical Journal, Cell Reports, eLife, Soft Matter, Nature Materials

### Conference Organizer

1. 8<sup>th</sup> Northeast Complex Fluids and Soft Matter Workshop (NCS8), Columbia University, New York, NY. January 12, 2018. (co-organizer)
2. Mechanobiology and Embryogenesis session at the 8th World Congress of Biomechanics, Dublin, Ireland, July 8-12, 2018. (session co-chair)

### Professional Organization Membership

American Physical Society (APS)  
American Society for Cell Biology (ASCB)  
Genetics Society of America (GSA)  
Society for Experimental Mechanics (SEM)

## Financial Support

### Funding from External Sources

#### Completed

1. Hay Whitney Foundation; Postdoctoral Fellowship  
PI: Karen Kasza  
04/01/2011-03/31/2014
2. Burroughs Wellcome Fund; Career Award at the Scientific Interface (postdoctoral portion)  
PI: Karen Kasza  
04/01/2014-12/31/2015

#### Current

3. Burroughs Wellcome Fund; Career Award at the Scientific Interface (faculty portion)  
PI: Karen Kasza  
01/01/2016-06/30/2019
4. Henry Luce Foundation; Clare Boothe Luce Assistant Professorship  
PI: Karen Kasza  
09/01/2016-08/31/2021
5. National Science Foundation; CAREER: Biophysical Mechanisms Underlying the Generation of Tissue Structure and Mechanics  
PI: Karen Kasza  
07/01/2018-06/30/2023
6. David & Lucile Packard Foundation; Understanding and controlling the forces that build multicellular tissue structures  
PI: Karen Kasza  
10/15/2018-10/14/2023

### Funding from Internal Sources

#### Completed

7. Columbia University; Provost's Grants Program for Junior Faculty Who Contribute to the Diversity Goals of the University  
PI: Karen Kasza  
02/01/2017-01/31/2018

## References

**Jennifer Zallen**, Member, Developmental Biology Program, Sloan Kettering Institute, HHMI  
1275 York Avenue, New York, NY, 10065 USA  
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**David Weitz**, Gordon McKay Professor of Applied Physics & Professor of Physics  
School of Engineering and Applied Sciences & Department of Physics, Harvard University  
29 Oxford Street, Cambridge, MA, 02138 USA  
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