

TAEYOON KIM

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Weldon School of Biomedical Engineering
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Position

Purdue University, Weldon School of Biomedical Engineering West Lafayette, IN, USA
Assistant Professor Aug. 2013 – present

Kyoto University, Institute for Frontier Life and Medical Sciences Kyoto, Japan
Visiting Research Scholar May 2017 – Aug. 2017

Education

Massachusetts Institute of Technology Cambridge, MA, USA
Ph.D., Department of Mechanical Engineering Feb. 2011
Advisor: Roger D. Kamm
Thesis committee: Roger D. Kamm, Mary C. Boyce, and Gareth McKinley
Thesis: Computational Study of Actin Morphology and Rheology

Massachusetts Institute of Technology Cambridge, MA, USA
S.M., Department of Mechanical Engineering Jun. 2007
Advisor: Roger D. Kamm
Thesis: Simulation of Actin Cytoskeleton Structure and Rheology

Seoul National University Seoul, Korea
B.S., Department of Mechanical Engineering Feb. 2004

Research Experience

University of Chicago, Institute for Biophysical Dynamics Chicago, IL, USA
Postdoctoral Associate Jan. 2011 – Jul. 2013
PIs: Margaret L. Gardel and Ed Munro

MIT, Department of Mechanical Engineering Cambridge, MA, USA
Postdoctoral Associate Oct. 2010 – Dec. 2010
PI: Roger D. Kamm

MIT, Department of Mechanical Engineering Cambridge, MA, USA
Graduate Research Assistant Sep. 2005 – Sep. 2010
Advisor: Roger D. Kamm

**Journal
Article**

23. Wonyeong Jung, A. Pasha Tabatabai, Jacob Thomas, S. M. Ali Tabei, Michael Murrell, and **Taeyoon Kim**. Dynamic motions of molecular motors in the actin cytoskeleton. *Cytoskeleton*, under review.
22. Wonyeong Jung*, Jing Li*, and **Taeyoon Kim**. Nonlinearly elastic and inelastic properties of cells: a new perspective on cell mechanics. *Open Biology*, in revision.
21. Katrina M. Wisdom, Dhiraj Indana, Pei-En Chou, Rajiv Desai, **Taeyoon Kim** (co-corr), and Ovijit Chaudhuri. Covalent cross-linking of basement membrane-like matrices physically restricts invasive protrusions in breast cancer cells. *Matrix Biology*, in revision.
20. Atsushi Matsuda*, Jing Li*, Peter Brumm, Taiji Adachi, Yasuhiro Inoue, and **Taeyoon Kim**. Mobility of molecular motors critically regulates contractile behaviors of actin networks. *Biophysical Journal*, accepted.
19. Abdel-Rahman Hassan, Thomas Biel, and **Taeyoon Kim** (2019) A mechanical model for durotactic cell migration. *ACS Biomaterials Science & Engineering*, online first.
18. Abdel-Rahman Hassan, Thomas Biel, David M. Umulis, and **Taeyoon Kim** (2019) Interplay between the persistent random walk and the contact inhibition of locomotion leads to collective cell behaviors. *Bulletin of Mathematical Biology*, online first.
17. Jing Li, **Taeyoon Kim**, and Daniel B. Szymanski (2019) Multi-scale regulation of cell branching: modeling morphogenesis. *Developmental Biology*, online first.
16. Qilin Yu*, Jing Li*, Michael P. Murrell, and **Taeyoon Kim** (2018) Balance between force generation and relaxation facilitates pulsed contraction of actin networks. *Biophysical Journal*, **115**(10), 2003-2013.
15. Jing Li*, Thomas Biel*, Pranith Lomada*, Qilin Yu, and **Taeyoon Kim** (2017) Buckling-induced F-actin fragmentation modulates contraction of active cytoskeletal networks. *Soft Matter*, **13**, 3213-3220.
14. Tamara Bidone*, Wonyeong Jung*, Daniel Maruri, Carlos Borau, Roger D. Kamm, and **Taeyoon Kim** (2017) Morphological transformation and force generation of active cytoskeletal networks. *PLOS Computational Biology*, **13**(1), e1005277.
13. Ian Linsmeier, Shiladitya Banerjee, Wonyeong Jung, Patrick Oakes, **Taeyoon Kim**, and Michael P. Murrell (2016) Disordered actomyosin networks are sufficient to produce cooperative and telescopic contractility. *Nature Communications*, **7**, 12615.
12. Wonyeong Jung, Michael P. Murrell, and **Taeyoon Kim** (2016) F-actin fragmentation induces distinct mechanisms of stress relaxation in the actin cytoskeleton. *ACS Macro Letters*, **5**, 641-645.
11. Michael Mak, Muhammad Zaman, Roger D. Kamm, and **Taeyoon Kim** (2016) Interplay of active processes modulates tension and drives phase transition in self-renewing, motor-driven cytoskeletal networks. *Nature Communications*, **7**, 10323.

**Journal
Article
(cont.)**

10. Michael Mak, **Taeyoon Kim**, Muhammad Zaman, and Roger D. Kamm (2015) Multiscale mechanobiology: computational models for integrating molecules to multicellular systems. *Integrative Biology*, **7**, 1093-1108.
9. Wonyeong Jung, Michael P. Murrell, and **Taeyoon Kim** (2015) F-actin cross-linking enhances stability of force generation in disordered actomyosin networks. *Computational Particle Mechanics*, **2**(4), 317-327.
8. Tamara Bidone, **Taeyoon Kim**, Marco Deriu, Umberto Morbiducci, and Roger D. Kamm (2015) Multiscale impact of nucleotides and cations on the conformational equilibrium, elasticity and rheology of actin filaments and crosslinked networks. *Biomechanics and Modeling in Mechanobiology*, **14**(5), 1143-1155.
7. **Taeyoon Kim** (2015) Determinants of contractile forces generated in disorganized actomyosin bundles. *Biomechanics and Modeling in Mechanobiology*, **14**(2), 345-355.
6. **Taeyoon Kim**, Margaret L. Gardel, and Ed Munro (2014) Determinants of fluid-like behavior and effective viscosity in cross-linked actin networks. *Biophysical Journal*, **106**(3), 526-534.
5. Carlos Borau*, **Taeyoon Kim***, Tamara Bidone, José Manuel Garcia-Aznar, and Roger D. Kamm (2012) Dynamic mechanisms of cell rigidity sensing: insights from a computational model of actomyosin networks. *PLOS One*, **7**(11), e49174.
4. **Taeyoon Kim**, Wonmuk Hwang, and Roger D. Kamm (2011) Dynamic role of crosslinking proteins in actin rheology. *Biophysical Journal*, **101**(7), 1597-1603.
3. Hyugsuk Lee, Benjamin Pelz, Jorge M. Ferrer, **Taeyoon Kim**, Matthew J. Lang, and Roger D. Kamm (2009) Cytoskeletal deformation at high strains and the role of cross-link unfolding or unbinding. *Cellular and Molecular Bioengineering*, **2**(1), 28-38.
2. **Taeyoon Kim**, Wonmuk Hwang, Hyungsuk Lee, and Roger D. Kamm (2009) Computational analysis of viscoelastic properties of crosslinked actin networks. *PLOS Computational Biology*, **5**(7), e1000439.
1. **Taeyoon Kim**, Wonmuk Hwang, and Roger D. Kamm (2009) Computational analysis of a cross-linked actin network. *Experimental Mechanics*, **49**, 91-104.

* indicates equal contribution

**Book
Chapter**

- Jing Li, Wonyeong Jung, Sungmin Nam, Ovijit Chaudhuri, and **Taeyoon Kim**. Roles of interactions between cells and extracellular matrices for migration and matrix remodeling. *Multi-Scale Extracellular Matrix Mechanics and Mechanobiology*, Springer, in press.
- Roger D. Kamm, **Taeyoon Kim**, and Wonmuk Hwang (2010) Ch. 13: Analysis of the Models for Cytoskeletal Rheology. *Tributes to Yuan-Cheng Fung on His 90th Birthday: Biomechanics: From Molecules to Man*, World Scientific.

Conference Proceeding **Taeyoon Kim**, Wonmuk Hwang, and Roger D. Kamm (2010) Computational investigation of dynamic properties of actin networks with crosslinking proteins. *First Global Congress on NanoEngineering for Medicine and Biology (NEMB)*, Houston, TX, USA.

Invited Seminar

15. Physics of Integrated Biological Systems, Sep. 11-21, 2018, Cargèse, France (invited to this workshop as a lecturer with a full travel support).
14. Departmental Seminar at Developmental Biology, Institute for Biology Paris-Seine, Jul. 4, 2018, Paris, France.
13. Departmental Seminar at Mechanical Engineering, University of Notre Dame, Aug. 22, 2017, Notre Dame, IN, USA.
12. Institute for Frontier Life and Medical Sciences, Kyoto University, May 17, 2017, Kyoto, Japan.
11. Departmental Seminar at Mechanical Engineering, Johns Hopkins University, Apr. 27, 2017, Baltimore, MD, USA.
10. Departmental Seminar at Physics, Washington University in St. Louis, Apr. 17, 2017, St. Louis, MO, USA.
9. Biophysics Seminar Series, University of Maryland, College Park, Mar. 6, 2017, College Park, MD, USA.
8. Pennsylvania Muscle Institute Seminar Series, University of Pennsylvania, Feb. 27, 2017, Philadelphia, PA, USA.
7. Physical and Engineering Biology Seminars Series, Yale University, May 3, 2016, New Haven, CT, USA.
6. UCSD Biomechanics and Mechanobiology Seminars Series, University of California, San Diego, Apr. 14, 2016, San Diego, CA, USA.
5. Departmental Seminar at Mechanical Engineering, Pohang University of Science and Technology, May 20, 2015, Pohang, South Korea.
4. IBS CSLM (Center for Soft and Living Matter) Seminar, Ulsan National Institute of Science and Technology, May 15, 2015, Ulsan, South Korea.
3. Colloquium at School of Life Sciences, Ulsan National Institute of Science and Technology, May 14, 2015, Ulsan, South Korea.
2. Joint Colloquium at Physics and BioEng Departments, Lehigh University, Apr. 9, 2015, Bethlehem, PA, USA.
1. Departmental Seminar at Biomedical Engineering, University of Michigan, Ann Arbor, Nov. 5, 2014, Ann Arbor, MI, USA.

**Oral
Conference
Presentation**

18. 8th World Congress of Biomechanics, Jul. 8-12, 2018, Dublin, Ireland. (invited as a keynote speaker)
17. Generation and Control of Forces in Cells, Jun. 11-29, 2018, Stockholm, Sweden. (invited)
16. Modeling Cellular Mechanics in Cancer, May 2-4, 2018, Minneapolis, MN, USA.
15. APS March Meeting, Mar. 5-9, 2018, Los Angeles, CA, USA. (invited)
14. 5th International Conference on Computational and Mathematical Biomedical Engineering, Apr. 10-12, 2017, Pittsburgh, PA, USA. (invited)
13. Society of Engineering Science 53rd Annual Technical Meeting, Oct. 2-5, 2016, College Park, MD, USA.
12. Active and Smart Matter, Jun. 20-23, 2016, Syracuse, NY, USA.
11. APS March Meeting, Mar. 14-18, 2016, Baltimore, MD, USA. (invited)
10. Biophysical Society Annual Meeting, Feb. 27-Mar. 2, 2016, Los Angeles, CA, USA.
9. Texas Mechanobiology Symposium, Oct. 25, 2015, College Station, TX, USA. (invited)
8. Society of Engineering Science 52nd Annual Technical Meeting, Oct. 26-28, 2015, College Station, TX, USA. (invited)
7. International Workshops on Advances in Computational Mechanics III, Oct. 12-14, 2015, Tokyo, Japan. (invited)
6. US-Korea Conference, Jul. 29-Aug. 1, 2015, Atlanta, GA, USA. (invited)
5. 15th International Congress of Biorheology - 8th International Conference on Clinical Hemorheology, May 24-28, 2015, Seoul, South Korea. (invited)
4. 7th World Congress of Biomechanics, Jul. 6-11, 2014, Boston, MA, USA. (invited)
3. BMES Annual Meeting, Oct. 24-27, 2012, Atlanta, GA, USA.
2. ASME 2010 First Global Congress on Nanoengineering for Medicine and Biology, Feb. 7-10, 2010, Houston, TX, USA.
1. BMES Annual Meeting, Oct. 2-4, 2008, St. Louis, MO, USA.

Professional 4. Guest editor for the special themed issue for Cytoskeleton (ongoing).

Activity

3. Reviewer for ACS Biomaterials Science & Engineering; ACS Macro Letter; ASME Journal of Biomechanical Engineering; Biophysical Journal; Biomechanics and Modeling in Mechanobiology; BioMedical Engineering OnLine; Communications Physics; Computational Particle Mechanics; Computers in Biology and Medicine; Journal of the Mechanical Behavior of Biomedical Materials; Nature Communications; Nature Physics; New Journal of Physics; PLOS Computational Biology; PLOS One; Proceedings A; PNAS; Physical Review E; Physical Review Letters; Physical Review X; Scientific Reports; Soft Matter; WIREs Systems Biology and Medicine.

2. Session Chair/Organizer: “Computational Modeling of Cellular and Cytoskeletal Mechanics,” 7th World Congress of Biomechanics, Boston, MA, USA, July 2014; “Mechanical Behaviors of Cytoskeleton and Cells,” Society of Engineering Science 53rd Annual Technical Meeting, College Park, MD, USA, Oct 2016; “Connecting Molecular Interactions to Cellular Behaviors via Computational Models,” 8th World Congress of Biomechanics, Dublin, Ireland, July 2018; BMES in 2016, 2017, and 2018.

1. Members of American Physical Society, Biophysical Society, and Biomedical Engineering Society.