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Training

Education

- **Ph.D. Mechanical Engineering**, Stanford University, 05/08
- **M.S. Mechanical Engineering**, Stanford University, 09/05
- **B.S. Mechanical Engineering**, University of California Berkeley, 05/02

Career Development

- **Zebrafish Development and Genetics**, Marine Biological Laboratory, 08/10
- **ORS/OREF/AAOS Grant Writing Workshop**, 01/08

Academic and Professional Positions

Academic

- **Senior Fellow**, University of Washington (Advisor: Ted S. Gross), 01/11-current
- **Postdoctoral Fellow**, La Jolla Bioengineering Institute (Advisor: John A. Frangos), 09/08-12/10
- **Graduate Research Assistant**, Stanford University, Cell and Molecular Biomechanics Laboratory (Advisor: Christopher R. Jacobs), 09/03-09/08
- **Graduate Research Assistant**, Stanford University, Laboratory for Virtual Experiments in Mechanics (Advisor: Adrian J. Lew), 09/03-09/08
- **Undergraduate Research Assistant**, University of California Berkeley, Orthopaedic Biomechanics Laboratory (Advisor: Tony M. Keaveny), 12/00-05/02

Professional

- **Nuclear Engineer**, Pearl Harbor Naval Shipyard, Hawaii, 08/02-08/03
- **Process Engineer**, New United Motors Manufacturing Incorporated, California, 08/01-12/01

Honors

Fellowships

- **National Institutes of Health NRSA Postdoctoral Fellowship**, 12/08-12/10
- **National Science Foundation Graduate Research Fellowship**, 09/03-09/06

Awards

- **Young Investigator Award**, American Society for Bone and Mineral Research, 10/10
- **Young Investigator Award**, International Bone Fluid Flow Workshop, 10/10
- **Pfizer Inc. Endowed Scholarship**, Marine Biological Laboratory, 08/10
- **Plenary Poster Presentation**, 2009 American Society for Bone and Mineral Research Annual Meeting, 09/09
- **2nd Place PhD Student Paper Competition**, 2008 ASME Summer Bioengineering Conference, 06/08

- **Best PhD Student Presentation**, Society for Physical Regulation in Biology and Medicine 25th Annual Scientific Conference, 01/07
- **Best PhD Student Presentation**, Society for Physical Regulation in Biology and Medicine 23rd Annual Scientific Conference, 01/05

Other

- **Ad Hoc Journal Reviewer**, The FASEB Journal, Cell and Molecular Bioengineering, Journal of Biomechanics, Journal of Theoretical Biology, Journal of Biomechanical Engineering, Computer Methods in Biomechanics and Biomedical Engineering
- **Ad Hoc Grant Reviewer**, Health Research Board (Ireland)
- **Bio-X Travel Award**, Stanford University, 09/08
- **Travel Award**, Society for Physical Regulation in Biology and Medicine, 01/05-01/07
- **Undergraduate Research Apprentice Program Fellow**, University of California Berkeley, 09/01-05/02

Teaching and Mentoring Responsibilities

Teaching

- **Co-Instructor (33%)**, Stanford University (Course: Mechanics of the Cell; Responsibilities: Wrote and administered lectures, course notes, homework, and exams), 09/07-12/07
- **Teaching Assistant**, Stanford University (Course: Mechanics of the Cell; Responsibilities: Administered office hours and study sections, wrote and corrected homework and exams), 03/05-06/05
- **Teaching Assistant**, Stanford University (Course: Orthopaedic Bioengineering; Administered office hours and study sections, wrote and corrected homework and exams), 09/04-12/04
- **Tutor**, Stanford University Upward Bound, 09/03-05/04
- **Tutor**, University of California Berkeley Upward Bound, 01/01-05/02
- **Tutor**, East Bay Asian Youth Center, 01/00-01/01
- **Tutor**, Americorps, 09/98-12/98

Undergraduate Students Supervised

- **Leah Downey** (Investigated role of miRNAs in muscle paralysis-induced bone loss), 10/11-current
- **Jeremiah M. Jones** (Developed tape-based tape transfer system for sectioning of bone; currently attending medical school at University of Iowa), 01/09-06/09
- **Clarence C. Quah** (Developed code for generating finite element models of lacunar-canalicular fluid flow), 05/07-09/07
- **Tyler R. Johnston** (Developed technique for viewing primary cilia in side view; currently attending medical school at Stanford University), 06/06-09/06
- **Oluwasheyi A. Ayeni**, Stanford Summer Undergraduate Research Experiences (Used image correlation analysis to track cellular deformations), 06/05-09/05
- **Pablo Abad-Manterola**, Stanford Summer Undergraduate Research Experiences (Developed algorithm for quantifying angular density of cytoskeletal filaments; attended California Institute of Technology for graduate school), 06/05-09/05

Professional Societies

- **American Society for Bone and Mineral Research**, 04/10-present
- **Orthopaedic Research Society**, 01/07-present

- **Society for Physical Regulation in Biology and Medicine**, 01/05-present

Invited Lectures

- **University of Rochester**, Department of Mechanical Engineering, 03/10
- **Rensselaer Polytechnic Institute**, Department of Biomedical Engineering, 02/10
- **Lehigh University**, Department of Mechanical Engineering and Mechanics, 02/10

Research Funding

Previously Funded Projects

- “**Osteocyte-independent mechanotransduction of interstitial fluid flow in bone**”, **National Institutes of Health (Bethesda, MD)**, **F32 AR056934 (PI, Total Costs: \$92,428)**, 12/08-12/10

Bibliography

Manuscripts in Refereed Journals

1. **Kwon RY** and Frangos JA. Quantification of lacunar-canalicular fluid flow through computational modeling of fluorescence recovery after photobleaching. *Cell Mol Bioeng*, 2010, 3(3) 296-306.*
2. **Kwon RY**, Temiyasathit S, Tummala P, Quah CC, and Jacobs CR. Primary-cilium dependent mechanosensing is mediated by adenylyl cyclase 6 and cyclic AMP in bone cells. *FASEB J*, 2010, 24(8) 2859-2868.*
3. **Kwon RY**, Meays DR, Tang WJ, and Frangos JA. Microfluidic enhancement of intramedullary pressure increases interstitial fluid flow and inhibits bone loss in hindlimb suspended mice. *J Bone Miner Res*, 2010, 25(8) 1798-1807.*
4. Arnsdorf EJ, Tummala P, **Kwon RY**, and Jacobs CR. Mechanically induced osteogenic differentiation - the role of RhoA, ROCKII and cytoskeletal dynamics. *J Cell Sci*, 2009, 122(4) 546-53.
5. Doll JC, Harjee N, Klejwa N, **Kwon RY**, Coulthard SM, Petzold BC, Goodman MB, and Pruitt BL. SU-8 force sensing pillar arrays for biological measurements. *Lab on a Chip*, 2009, 9 1449-1454.
6. **Kwon RY**, Lew AJ, and Jacobs CR. A microstructurally informed model for the mechanical response of three-dimensional actin networks. *Comput Methods Biomed Biomed Engin*, 2008, 11(4) 407-18.*
7. You L, Temiyasathit S, Lee P, Kim CH, Tummala P, Yao W, Kingery W, Malone AM, **Kwon RY**, and Jacobs CR. Osteocytes as mechanosensors in the inhibition of bone resorption due to mechanical loading. *Bone*, 2008 42(1) 172-9.
8. Malone AM, Anderson CT, Tummala P, **Kwon RY**, Johnston TR, Stearns T, and Jacobs CR. Primary cilia mediate mechanosensing in bone cells by a calcium-independent mechanism. *Proc Natl Acad Sci USA*, 2007, 104(33) 13325-30.
9. **Kwon RY** and Jacobs CR. Time-dependent deformations in bone cells exposed to fluid flow in vitro: investigating the role of cellular deformation in fluid flow-induced signaling. *J Biomech*, 2007, 40(14) 3162-8.*
10. Malone AM, Batra NN, Shivaram G, **Kwon RY**, You L, Kim CH, Rodriguez J, Jair K, and Jacobs CR. The role of actin cytoskeleton in oscillatory fluid flow-induced signaling in MC3T3-E1 osteoblasts. *Am J Physiol Cell Physiol*, 2007, 292(5) C1830-6.

11. Bayraktar HH, Gupta A, **Kwon RY**, Papadopoulos P, and Keaveny TM. The modified super-ellipsoid yield criterion for human trabecular bone. *J Biomech Eng*, 2004, 126(6) 677-84.

Submitted Manuscripts

1. **Kwon RY**, Meays DR, Jones J, Meilan AS, Miramontes R, Kardos N, Yeh JC, and Frangos JA. Structural adaptation to intramedullary pressure-driven interstitial fluid flow is enhanced in mice with targeted osteocyte ablation.
2. **Kwon RY**, Meays DR, Miramontes R, Kardos N, and Frangos JA. Disruption of glucose homeostasis in mice with targeted ablation of osteocytes.

Book Chapters

1. **Kwon RY**, Hoey D, and Jacobs CR. Mechanobiology of primary cilia. In *Cellular and Biomolecular Mechanics and Mechanobiology*, Springer, 2011

Books

1. Jacobs CR, Huang H, and **Kwon RY**. An Introduction to Cell Mechanics and Mechanobiology. *Garland Science*, expected publication date: 09/12.

Abstracts: Podium Presentations (RYK presenting author unless noted by *)

1. **Kwon RY**, Meays DR, Meilan AS, Kardos NL, and Frangos JA. Osteocyte-independent mechanotransduction of interstitial fluid flow. *American Society for Bone and Mineral Research Annual Meeting*, 2010.
2. **Kwon RY**, Meays DR, Meilan AS, Kardos NL, and Frangos JA*. Osteocyte-independent mechanotransduction of interstitial fluid flow. *Sun Valley Workshop on Musculoskeletal Biology*, 2010.
3. **Kwon RY**, Meays DR, and Frangos JA*. Microfluidic enhancement of intramedullary pressure increases interstitial fluid flow and inhibits hindlimb unloading-induced bone loss in mice. *Biomedical Engineering Society Annual Meeting 2009*.
4. Melchior, B, **Kwon RY**, and Frangos JA*. Inter-endothelial junctional inclination determines flow direction sense in endothelial cells. *Biomedical Engineering Society Annual Meeting 2009*.
5. **Kwon RY**, Meays DR, and Frangos JA. Microfluidic enhancement of skeletal fluid flow inhibits hindlimb unloading-induced bone loss in mice. *Society for Physical Regulation in Biology and Medicine 2009*.
6. **Kwon RY**, Temiyasathit S*, Tummala P, Quah CC, and Jacobs CR. Adenylyl cyclase 6 and cAMP mediate primary cilia-dependent mechanosensing in bone cells. *Society for Physical Regulation in Biology and Medicine 2009*.
7. **Kwon RY**, Temiyasathit S, Tummala P, Quah CC, and Jacobs CR. Adenylyl cyclase 6 mediates primary cilia-regulated decreases in cAMP in bone cells exposed to dynamic fluid flow. *American Society for Bone and Mineral Research Annual Meeting, 2008*, *JBMR* 23:S13.
8. **Kwon RY**, Temiyasathit S*, Tummala P, Quah CC, and Jacobs CR. Investigating the role of primary cilia in oscillatory fluid flow-induced increases in intracellular cAMP levels in MC3T3-E1 osteoblastic cells. *Trans Orthopaedic Research Society 2008*.
9. **Kwon RY**, Jacobs CR, and Lew AJ. A microstructurally informed model for the three-dimensional mechanical response of actin networks. *US National Congress on Computational Mechanics 2007*.
10. **Kwon RY**, and Jacobs CR. Viscoelasticity of bone cells exposed to fluid flow in vitro. *Trans Orthopaedic Research Society 2007*, 150.
11. Johnston TR*, **Kwon RY**, and Jacobs CR. Side view characterization of bone cells and their primary cilia using adapted fluid flow chamber. *Trans Orthopaedic Research Society 2007*, 147.

12. Clowes EJ*, **Kwon RY**, Tummala P, Carter DR, and Jacobs CR. Role of cytoskeletal tension in osteogenesis due to loading induced fluid flow. *Trans Orthopaedic Research Society 2007*, 150.
13. **Kwon RY**, and Jacobs CR. Viscoelasticity of bone cells exposed to fluid flow in vitro. *Society for Physical Regulation in Biology and Medicine 2007*.
14. **Kwon RY**, Jacobs CR, and Lew AJ. Homogenization of the actin cytoskeleton: An approach based on finite element analysis, microstructure characterization and weighted principal component analysis. *Trans Orthopaedic Research Society 2006*, 363.
15. **Kwon RY**, Ayeni, OA, and Jacobs CR. Investigation of the mechanics of bone cells exposed to fluid flow. *Trans Orthopaedic Research Society 2006*, 129.
16. **Kwon RY**, Ayeni, OA, and Jacobs CR. Mechanics of deformation of osteoblastic cells exposed to steady and oscillatory fluid flow. *Society for Physical Regulation in Biology and Medicine 2006*.
17. **Kwon RY**, Abad-Manterola P, Lew A, and Jacobs CR. Computational modeling of actin networks and the cytoskeleton. *Society for Physical Regulation in Biology and Medicine 2005*.
18. **Kwon RY**, Abad-Manterola P, Jacobs CR, and Lew A. Computational modeling of actin networks and the cytoskeleton. *California Tissue Engineering Annual Meeting 2004*.
19. Bayraktar HH*, Gupta A, **Kwon RY**, and Keaveny TM. Multiaxial failure behavior of human femoral trabecular bone. *Trans Orthopaedic Research Society 2003*, 202.

Abstracts: Poster Presentations

1. Worton LE, **Kwon RY**, Gardiner EM, Gross TS, and Srinivasan S. Fluid flow-induced early response genes are selectively altered by age. *American Society for Bone and Mineral Research Annual Meeting*, 2011.
2. **Kwon RY**, Meays DR, Kardos NL, and Frangos JA. Regulation of energy metabolism by osteocytes. *American Society for Bone and Mineral Research Annual Meeting*, 2010.
3. **Kwon RY**, Meays DR, and Frangos JA. Microfluidic enhancement of intramedullary pressure increases interstitial fluid flow and protects against hindlimb unloading-induced bone loss in mice. *American Society for Bone and Mineral Research Annual Meeting*, 2009.
4. **Kwon RY**, Temiyasathit S, Tummala P, Quah CC, and Jacobs CR. Adenylyl cyclase 6 mediates primary cilia-dependent changes in cyclic adenosine monophosphate in response to dynamic fluid flow. *ASME Summer Bioengineering Conference 2009*.
5. **Kwon RY**, Meays DR, and Frangos JA. Oscillatory intramedullary pressure generated by a novel microfluidic system enhances interstitial transport and inhibits hindlimb unloading-induced bone loss in mice. *New York Skeletal Biology and Medicine Conference*, 2009.
6. **Kwon RY**, Temiyasathit S, Tummala P, Quah CC, and Jacobs CR. Primary cilia mediate intracellular cAMP responses in bone cells exposed to dynamic fluid flow. *ASME Summer Bioengineering Conference 2008*, 192511.
7. **Kwon RY**, Quah, CC, and Jacobs CR. Computational models of fluid flow through the osteocyte pericellular space show substantial loading on their cell bodies due to pressure gradients. *Trans Orthopaedic Research Society 2008*.
8. Doll JC, Harjee N, Klejwa N, **Kwon RY**, Coulthard S, and Pruitt BL. Biological measurements of C. Elegans touch sensitivity with microfabricated force sensors. *MicroTAS 2007*, 0896.
9. Klejwa N, Harjee N, **Kwon RY**, Coulthard S, and Pruitt BL. Transparent SU-8 three-axis micro strain gauge force sensing pillar arrays with biological applications. *Transducers 2007*, AM0261.
10. **Kwon RY**, Jacobs CR, and Lew AJ. A novel approach to image based modeling of the actin cytoskeleton. *ASME Summer Bioengineering Conference 2006*.
11. **Kwon RY**, Jacobs CR, and Lew AJ. Computational modeling of actin networks. *ASME Summer Bioengineering Conference 2005*.

12. **Kwon RY**, Ayeni, OA, and Jacobs CR. Mechanics of deformation of bone cells. *Biomedical Computation at Stanford 2005*.
13. Keaveny TM, Bayraktar HH, and **Kwon RY**. Shear loading is the weakest link for femoral neck trabecular bone. *Trans Orthopaedic Research Society 2002*, 555.