

Kristina Haase

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Center for Interdisciplinary Nanophysics
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Objective

To develop new physical tools and complimentary computational analyses, in order to investigate cell mechanics, the mechanisms behind mechanotransduction, and collective cell behaviour.

Education

Doctorate in Philosophy, Physics

University of Ottawa, Ottawa, Ontario, 2010 – Nov. 2014

Thesis entitled: *Mechanics and Mechanotransduction of Adherent Cells - A Compendium of Atomic Force Microscopy Studies*

- Nominated for best thesis award for 2014-2015 academic year.
- Member of the Pelling lab (www.pellinglab.net) in the Center for Interdisciplinary Nanophysics
- Work involves cellular assays and microscopy techniques (atomic force and confocal microscopy) in order to examine the underlying mechanisms involved in cellular force transduction

Master of Applied Science, Mechanical Engineering

University of Ottawa, Ottawa, Ontario 2007-2010

Thesis entitled: *Finite Element Analysis of Orthopaedic Plates and Screws to Reduce the Effects of Stress Shielding*

- Focused studies on biomechanics, implant devices, and orthopaedics research, along with computational methods including finite element analysis.

Bachelor of Engineering, Mechanical Engineering

Carleton University, Ottawa, Ontario 2001-2006

Research Interests

- Collective cell motion, tumorigenesis, epithelial-mesenchymal transitions
- Mechanotransduction and mechanosensitivity of the cellular membrane-cortex, cytoskeletal filaments, and nucleus
- Scanning probe microscopy for investigation of cell mechanics, and intercellular signalling
- Confocal microscopy, and fluorescence microscopy techniques in conjunction with unique biomaterials, and development of cellular scaffolds for 3D cell culture
- Nanolithography, and device design for examination of monolayers to combinatorial stimuli
- Finite element analysis of cell mechanics
- Homeoviscous adaptation, specifically in horizontal neurons from goldfish

Recent Publications

- **Haase, K.**, & Pelling, A.E. "Investigating Cell Mechanics with Atomic Force Microscopy" *Journal of the Royal Society Interface*, 12(104), 20140970 (2015).
- Modulevsky, D.J., Lefebvre, C., **Haase, K.**, Al-Rekabi, Z., & Pelling, A.E. "Apple Derived Cellulose Scaffolds for 3D Mammalian Cell Culture." *Plos One*, 9(5): e97835 (2014).
- Al-Rekabi, Z., **Haase, K.**, & Pelling, A.E. "Microtubules mediate changes in membrane nanomechanics during contractile activation." *Experimental Cell Research*, 322(1): p.21-29 (2014).
- **Haase, K.**, & Pelling, A.E. "The Role of the Actin Cortex in Maintaining Cell Shape." *Communicative & Integrative Biology*, 6(6): e26714 (2013).

- **Haase, K.**, & Pelling, A.E. "Resiliency of the Plasma Membrane and Actin Cortex to Large-Scale Deformation." *Cytoskeleton*, 70(9): p. 494-514(2013).
- **Haase, K.**, & Rouhi, G. "Prediction of stress shielding around an orthopaedic screw: Using stress and strain energy density as mechanical stimuli." *Computers in Biology and Medicine*, 43(11): p.1748-1757 (2013).
- Bukoreshtliev, N.V., **Haase, K.**, & Pelling, A.E. "Mechanical Cues in Cellular Signalling and Communication." *Cell and Tissue Research*, 352(1): p. 77-94 (2013).
- Guolla, L., Bertrand, M., **Haase, K.**, & Pelling, A.E. "Force Transduction and Strain Dynamics in Actin Stress Fibres in Response to Nanonewton Forces." *Journal of Cell Science*, 125(3): p. 603-613 (2012).
- **Haase, K.**, & Rouhi, G. "A discussion on plating factors that affect stress shielding using finite element analysis." *Journal of Biomechanical Science and Engineering*. 5(2): p. 1-13 (2010).

Book Chapters

- **Haase, K.**, Al-Rekabi, Z., & Pelling, A.E. "Mechanical cues direct focal adhesion dynamics." *Progress in Molecular Biology and Translational Science*. 126, 103 (2014).
- **Haase, K.**, Tremblay, D., & Pelling, A.E. "Mechanotransduction: Probing its Mechanisms at the Nanoscale using the Atomic Force Microscope." Takeyasu, K. ed. *Atomic Force Microscopy in Nanobiology*. Pan Stanford Publishing (2014).
- Al-Rekabi, Z., Tremblay, D., **Haase, K.**, Leask, R.L., & Pelling, A.E. "Computational and Experimental Approaches to Cellular and Subcellular Tracking at the Nanoscale." Musa, S.M. ed. *Computational Nanotechnology: Modeling and Applications with MATLAB*. New York: CRC Press, pp.333-361 (2011).

Conferences and workshops (* indicates podium presentations)

- **Haase, K.***, Gullekson, C., & Pelling, A.E. "The force is strong in these cells." *Cell Dynamics Workshop*, Keene, Ontario (2014).
- **Haase, K.**, Shendruk, T., Slater, G., & Pelling, A.E. "The Role of the Cortex & the Cytoplasm in Deformations of the Plasma Membrane." *BPS*. San Francisco, California (2014).
- **Haase, K.***, & Pelling, A.E. "Nano-forces reveal cell resiliency via the membrane and cytoskeleton." *Cell Dynamics Workshop*, Keene, Ontario (2013).
- **Haase, K.***, & Pelling, A.E. "Membrane Resiliency Following Large-Scale Local Deformations Using an AFM." *AFM-Based Nanoscopies in the Life Sciences. M&M*. Indianapolis, Indiana (2013).
- **Haase, K.***, & Pelling, A.E. "Mechanotransduction through the Plasma Membrane." *Cytoskeleton and Biomechanics – Biochemical Mechanisms. APS*. Boston, Massachusetts (2012).
- **Haase, K.***, & Rouhi G. "FEA of Mechanical Stimuli Transfer between Orthopaedic Screws and Surrounding Bone." *CSB*, Kingston, Ontario (2010).
- **Haase, K.***, & Rouhi G. "Reducing Stress Shielding: FEA of Orthopaedic Screws." *CANCAM*, Halifax, Nova Scotia (2009).
- **Haase, K.**, & Rouhi, G. "Stress or strain energy density of osteogenesis stimuli? FEA of orthopaedic screws." *Orthopaedic Research Society 55th Annual Meeting*, Las Vegas, Nevada (2009).
- **Haase, K.***, & Rouhi, G. "Finite element analysis of a fracture fixation plate: a parametric study." *The 31st Conference of the Canadian Medical and Biomedical Engineering Society (CMBES)*, Montreal, Quebec (2008).
- **Haase, K.***, & Rouhi, G. "Finite element analysis of a fracture fixation plate." *The Canadian Society for Mechanical Engineering (CSME)*, Ottawa, Ontario (2008).

Leadership & Service

- Vice President, Physics Graduate Student Association (PGSA), University of Ottawa, 2013-2014
- PGSA volunteer summer 2014-present
- Member, American Physical Society, 2012-present
- Member, Biophysical Society, 2013-present

References

- Dr. Andrew Pelling (*PhD thesis supervisor*)
Associate Professor, Department of Physics & Biology, University of Ottawa
a@pellinglab.net
- Dr. James Harden (*comprehensive committee member*)
Associate Professor, Department of Physics, University of Ottawa
jharden@uottawa.ca
- Dr. Gholamreza Rouhi (*Master's thesis supervisor*)
Assistant Professor of Biomedical Engineering, Amirkabir University of Technology
Adjunct Professor, School of Human Kinetics, University of Ottawa
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