

# Qunyang Li

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## EDUCATION

**Brown University**, Providence, RI

**Ph. D.** in Engineering, May 2008

Dissertation: “*Micromechanics of pseudo-single-asperity friction: effects of nanometer-scale roughness.*”

Advisor: Kyung-Suk Kim

**Sc. M.** Applied Mathematics, May 2007

**Tsinghua University**, Beijing, China

**Sc. M.** Engineering Mechanics, 2003

Thesis: “*Mechanics studies on micro- adhesive contact and instability of thin films.*”

Advisor: Shouwen Yu

**Sc. B.** Engineering Mechanics, 2001

## RESEARCH EXPERIENCE

**Research Assistant**, Nano and Micro Mechanics Laboratory, Brown University, 2003-present

- Friction at the nano- and micrometer scale: instrumentation for quantitative force measurement using atomic force microscopy (AFM); experimental investigation of friction and wear behaviors at the nanometer scale; hierarchical mechanics modeling of frictional processes considering roughness and environmental effects.
- Lubrication mechanism of *lubricin* protein from synovial fluid in human body joints: adsorption of macromolecules to various substrates; role of *lubricin* in modifying the inter-surface adhesion and friction.
- Scale bridging of interface adhesion: experimental study on adhesion enhancement of polymer interfaces by morphological modifications; modeling of adhesion characteristics for inhomogeneous interfaces.

**Research Assistant**, Key Laboratory of Failure Mechanics, Tsinghua University, China, 2001-2003

- Finite element simulation of elasto-plastic contact considering inter-surface adhesion.
- Three-dimensional pattern instability of a soft elastic film under van der Waals forces.
- Finite element study on buckling and delamination of thin films under indentation.

## PUBLICATIONS

- **Li, Q.** & Kim, K.-S. 2008 Micromechanics of friction: effects of nanometer-scale roughness. *Proceedings of the Royal Society A*, 464(2093), 1319-1343.
- **Li, Q.**, Kim, K.-S. & Rydberg, A. 2006 Lateral force calibration of an atomic force microscope with a diamagnetic levitation spring system. *Review of Scientific Instruments*, 77, 065105.
- Huang, S., **Li, Q.**, Feng, X. & Yu, S. 2006 Pattern instability of a soft elastic thin film under van der Waals forces. *Mechanics of Materials*, 38, 88-99.
- **Li, Q.** & Yu, S. 2004 A model for computational investigation of elasto-plastic normal and tangential contact considering adhesion effect. *Acta Mechanica Sinica*, 20, 165-171.
- **Li, Q.** & Kim, K.-S. Micromechanics of pseudo-single-asperity friction: an interfacial roughness layer model. *In preparation.*

## RESEARCH INTERESTS

- Friction and adhesion at the nanometer scale: quantitative measurement and modeling; chemical and environmental effects on the intrinsic surface properties.
- Instrumentation for quantitative measurement of mechanical interactions at small scale under complex conditions, e.g. applications in micro- & nano-electro-mechanic systems (M&NEMS) and biological systems.
- Numerical simulations of the surface interactions at the micro- & nano- scale: e.g. molecular dynamics (MD) and finite element method (FEM).
- Bridging the understandings of intrinsic nano-scale properties to the macroscopic behaviors; mechanism-based meso-scale modeling and optimization.

## SKILLS

- Strong experience with atomic force microscope (AFM) both for qualitative imaging and quantitative force measurement; knowledgeable at AFM calibration and probe modification.
- Proficient in the use of scanning electron microscope, white light interferometer and electro-speckle interferometer for micro- and nano- surface and deformation characterization.
- Familiar with polymer surface fabrication, electron-beam evaporation/deposition, functionalization of solid surfaces for mechanical and biological studies.
- Proficient in FORTRAN, Matlab and Mathematica.
- Proficient in commercial finite element software, particularly ABAQUS, and familiar with engineering designing tool, SolidWorks.

## TEACHING EXPERIENCE

**Teaching Assistant**, Brown University, Spring 2005 and Spring 2007

Course: “*Dynamics and Vibrations*” (undergraduate level)

Instructors: Prof. K.-S. Kim, Prof. W. Curtin, Prof. T. Powers

**Teaching Assistant**, Brown University, Fall 2006

Course: “*Mathematical Methods in Engineering and Physics*” (graduate level)

Instructor: Prof. L. B. Freund

## HONORS & AWARDS

- *The Outstanding Thesis Award*, Division of Engineering, Brown University, 2008.
- *William N. Findley Award*, Division of Engineering, Brown University, 2006.
- *James R. Rice Graduate Fellowship*, Brown University, 2003.
- *Dean's Fellowship*, Graduate School, Brown University, 2003.
- *Outstanding Thesis Award* for master's thesis, Tsinghua University, 2003.
- *Graduate with Excellency*, Tsinghua University, 2003.
- *Honorable Excellent Graduate Scholarship*, First Class, Tsinghua University, 2002.
- Consecutive scholarships for excellent undergraduate students, Tsinghua University, 1998-2000.

## REFERENCES

Available upon request