

Name

Contact Information

Education

University of Pennsylvania, School of Engineering & Applied Sciences, Philadelphia, PA May 2013

Ph.D. Candidate in Mechanical Engineering and Applied Mechanics, GPA: 3.59/4.0

Thesis: Mechanics of Interactions and Atomic-Scale Wear of Tips in Amplitude Modulation Atomic Force Microscopy Probes.

Adviser: Professor Robert W. Carpick

Villanova University, College of Engineering, Villanova, PA

May 2004

M.Sc. in Mechanical Engineering, GPA: 3.87/4.0

Thesis: Established an iterative numerical algorithm to optimize the design of drawbeads used to overcome the effects of the material anisotropy and friction to minimized manufacturing defects in deep drawing process.

Sharif University of Technology, Mechanical Engineering, Tehran, Iran

Jul. 1998

B.Sc. in Mechanical Engineering, <http://www.sharif.ir/web/en>

Senior Project: Studied, designed, built and tested a hydraulic generator capable of working in a condition with no or very low head hydro potential for limited electrical power generation. The project was the recipient of the best thesis award among all the engineering college graduates nationwide in the field of heat and fluid mechanics in October 1999, awarded by the Iranian Society of Mechanical Engineers.

Research Interests

Nanomechanics, nanotribology, atomic force microscopy, and transmission electron microscopy particularly studying the tip-sample interaction forces/stresses and nano-scale wear of AM-AFM probes. Specific research efforts involve performing controlled AM-AFM experiments and periodic transmission electron microscopy imaging.

Research Experience

Research Specialist/PhD Candidate

Oct. 2008 – Jun. 2013

University of Pennsylvania, Department of Mechanical Engineering and Applied Mechanics

- Studied the nano-scale wear of the tips and nanomechanics of the atomic force microscopy probes using atomic force microscopy, transmission electron microscopy, and profilometry (*NAME et al., ACS Nano*, 2013, 7:3221-3235)
- Characterized and studied design improvement of monolithic ultrananocrystalline diamond AFM probes developed by Advanced Diamond Technologies, Inc. (*N. Moldovan et al., J. Microelectromech. S.*, 2012, 21: 431-442)
- Studied AFM probe out-of-plane stiffness calibration in collaboration with the United Kingdom National Physical Laboratory
- Taught undergraduate and graduate courses as a teaching assistant: Thermodynamics I; Statics and Strength of Materials; Nanomechanics and Nanotribology
- Supervised a senior undergraduate mechanical engineering student to study, design and fabricate a CO₂ Snow Surface Cleaning device
- Co-mentored a high school teacher to study the Lotus leaf effect and to develop a macro-scale model of an AFM as a part of the “Research Experience for Teachers” program

Research Specialist

Aug. 2004 - Sep. 2008

University of Pennsylvania, Department of Radiology

- Studied the functional and metabolic imaging (MRI) techniques using Hyperpolarized ³He and ¹³C

- Designed and built devices for polarizing, detecting, and transporting ^3He and ^{13}C (S. Kadlecěk *et al.*, NMR Biomed., 2011, 24: 933-942)
- Designed and built a pneumatic actuator by updating a manual glass valve

Graduate Assistant

Jan. 2002 - May 2004

Villanova University, Department of Mechanical Engineering

- Performed finite element analysis to establish a numerical iterative method for designing optimized fixtures used in the deep drawing manufacturing process to control material flow (NAME *et al.*, J. Mater. Process. Tech., 2006, 176: 70-76)
- Performed thermal analysis on an Ultraviolet Meteor Telescope using Thermal Desktop and AutoCAD (E. McAssey *et al.*, Proc. of the ASME Summer Heat Transfer Conference, 2005, 4:721-728)
- Taught undergraduate laboratory courses: Steam Turbine Lab, Pipe Friction & Viscosity Lab

Awards/Honors**Best Animation Award**

Oct. 2011

The Nano/Bio Interface Center Local Probe Symposium, University of Pennsylvania

- Animated the importance of nano-scale studies (particularly atomic force microscopy) in understanding physical phenomena in larger scales: micro- and macro-scale

The Philadelphia Section of STLE Scholarship

May 2011

Society of Tribologists and Lubrication Engineers

- Received scholarship for studies in the field of tribology

Third Place Poster Award

Apr. 2011

18th International Conference on Wear of Materials; Awarded by **Bruker Corporation**

- Presented evaluating atomic-scale wear of amplitude modulation atomic force microscopy probes

Best Thesis Award

Oct. 1999

Iranian Society of Mechanical Engineers (an ASME cooperating society)

- Awarded to the best senior project in the field for its novelty, applicability and relevance to the technological needs of the society

Industry Experience**Design Engineer**

Nov. 1999 - Dec. 2001

Nasir Energy Gostar Ind. & Const. Co. (N.I.C.C), Tehran, Iran

- Designed and inspected the production and installation of Acoustic Punched Metal Suspended Ceiling's substructure of Tehran's new international airport's passenger terminal in collaboration with Fural Metalldecken GmbH Co., Gmunden, Austria

Technical Expert (Part-time)

Jul. 1995 - Oct. 1998

Jahesh Sanat Co. (affiliated to Sharif University of Technology), Tehran, Iran

- Designed and inspected the fabrication of two subunits of a Round Bar Peeling Machine used in steel production factory, industrial centrifugal fans, accurate measuring tools for quality control, and a pressure test device to test the safety of an Automobile under pressure valve
- Reverse engineered and defined mass production procedures of a Classical Under-pressure Irrigation System utilized for modernizing agriculture

Skills

- **Microscopy techniques:** Atomic force microscopy, transmission electron microscopy, and profilometry to study nano-scale mechanics of the AFM tip and sample interactions and nanotribology

- **Numerical techniques:** MATLAB coding and finite element analysis (experience with ANSYS, LS-DYNA, and Thermal Desktop)
- **Data analysis:** using MATLAB, Maple, and OriginPro
- **Machine and structural designing:** Stress analysis and mechanical design, providing detail/shop drawing and layouts using AutoCAD and Solid Works
- **Fabrication techniques:** classical machining, defining mass production processes, and quality control

Publications

Peer Reviewed Articles:

1. **NAME**, D.S. Grierson, K.T. Turner, R.W. Carpick. *Mechanics of Interaction and Atomic-Scale Wear of Amplitude Modulation Atomic Force Microscopy Probes*. ACS Nano, 2013, 7:3221-3235.
2. N. Moldovan, Z. Dai, H. Zeng, J.A. Carlisle, T.D.B. Jacobs, **NAME**, D.S. Grierson, J. Liu, K.T. Turner, R.W. Carpick. *Advances in Manufacturing of Molded Tips for Scanning Probe Microscopy*. J. Microelectromech. S., 2012, 21:431-442.
3. S. Kadlecsek, **NAME**, T. Nakayama, D. Ng, K. Emami, R. Rizi. *A Simple and Low-Cost Device for Generating Hyperpolarized Contrast Agents Using Parahydrogen*. NMR Biomed., 2011, 24:933-942.
4. K. Emami, S. Kadlecsek, J. Woodburn, J. Zhu, J. Yu, **NAME**, S. Pickup, M. Ishii, R. Rizi. *Improved Technique for Measurement of Regional Fractional Ventilation by Hyperpolarized ³He MRI*. Magnet. Reson. Med., 2010 Jan; 63:137-150.
5. J. Yu, M. Law, S. Kadlecsek, K. Emami, M. Ishii, M. Stephen, J. Woodburn, **NAME**, R. Rizi. *Simultaneous Measurement of Pulmonary Partial Pressure of Oxygen and Apparent Diffusion Coefficient by Hyperpolarized He-3 MRI*. Magnet. Reson. Med., 2009 May; 61:1015-21.
6. J. Yu, M. Ishii, M. Law, J. Woodburn, K. Emami, S. Kadlecsek, **NAME**, R. Guyer, R. Rizi. *Optimization of Scan Parameters in Pulmonary Partial Pressure Oxygen Measurement by Hyperpolarized ³He MRI*. Magnet. Reson. Med., 2008, 59:124-131.
7. J. Yu, S. Rajaei, M. Ishii, M. Law, K. Emami, J. Woodburn, S. Kadlecsek, **NAME**, R. Rizi. *Measurement of Pulmonary Partial Pressure of Oxygen and Oxygen Depletion Rate with Hyperpolarized ³He MRI: a Preliminary Reproducibility Study on Pig Model*. Acad. Radiol. 2008 Jun; 15:702-12.
8. K. Emami, R. Cadman, J. Woodburn, M. Fischer, S. Kadlecsek, J. Zhu, S. Pickup, R. Guyer, M. Law, **NAME**, M. Friscia, M. Ishii, J. Yu, W. Geftter, J. Shrager, R. Rizi. *Early Changes of Lung Function and Structure in an Elastase Model of Emphysema – A Hyperpolarized ³He MRI Study*. J. Appl. Physiol., 2008 Mar; 104:773-86.
9. M. Ishii, K. Emami, S. Kadlecsek, S. Petersson, K. Golman, **NAME**, J. Yu, R. Cadman, J. Woodburn, M. Stephen, D. Lipson, R. Rizi. *Hyperpolarized ¹³C MRI of the Pulmonary Vasculature and Parenchyma*. Magnet. Reson. Med., 2007, 57:459-463.
10. **NAME**, S. Santhanam, Y. Chun. *A Numerical Investigation on the Use of Drawbeads to Minimize Ear Formation in Deep Drawing*. J. Mater. Process. Tech., 2006, 176:70-76.
11. S. Kadlecsek, K. Emami, M. Fischer, M. Ishii, J. Yu, J. Woodburn, M. NikKhah, **NAME**, D. Lipson, J. Baumgardner, R. Rizi. *Imaging Physiological Parameters with Hyperpolarized Gas MRI*. Progr. Nucl. Magnet. Reson. Spectrosc., 2005, 47:187-212.

12. M. Fischer, S. Kadlecek, J. Yu, M. Ishii, K. Emami, **NAME**, D. Lipson, R. Rizi. *Measurements of Regional Alveolar Oxygen Pressure Using Hyperpolarized ^3He MRI*. Acad. Radiol., 2005, 12:1430-1439.
13. Z. Spector, K. Emami, M. Fischer, J. Zhu, M. Ishii, **NAME**, J. Yu, S. Kadlecek, B. Driehuys, D. Lipson, W. Geftter, J. Shrager, R. Rizi. *Quantitative Assessment of Emphysema Using Hyperpolarized ^3He MRI*. Magnet. Reson. Med., 2005, 53:1341-1346.

Articles in Preparation:

1. **NAME**, R.W. Carpick. *Mapping Stress and Operating in Minimal Tip Wear/Sample Deformation Regime in Amplitude Modulation Atomic Force Microscopy*.
2. **NAME**, K.E. Ryan, Y. Jiang, K.T. Turner, J.A. Harrison, R.W. Carpick. *Atomic-Scale Wear of Diamond-like Carbon in Single Asperity Repetitive Contact Formation and Breakage*.

Conference Proceedings:

1. **NAME**, D.S. Grierson, K.T. Turner, R.W. Carpick. *Nano-scale Forces, Stresses, and Tip Geometry Evolution of Amplitude Modulation AFM Probes*. Proc. Of the ASME 2011 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, Washington, DC, Aug. 28-31, 2011.
2. **NAME**, K. Emami, J. Woodburn, R. Cadman, J. Yu, H. Kim, M. Ishii, R. Rizi. *Validation of Regional Compliance Measurement Using Hyperpolarized ^3He MRI in a Syringe Lung Phantom*. Proc. of ISMRM, 16th Scientific Meeting & Exhibition, Toronto, Canada, 2008.
3. **NAME**, S. Kadlecek, S. Rajaei, J. Yu, K. Emami, J. Woodburn, M. Ishii, F. Hammond, R. Rizi. *Method for Continuous Measurement of Nuclear Para State Enrichment in Hydrogen Gas with Applications to Hyperpolarized Heteronuclear Contrast Agents*. Proc. of ISMRM, 14th Scientific Meeting & Exhibition, Seattle, Washington, 2006.
4. **NAME**, Y. Chun and S. Santhanam. *A Numerical Study on the Use of Draw Beads to Minimize the Earing Defect in Deep Drawing*. Transactions of the North American Manufacturing Research Institute of SME, 2005, 33:383-390.
5. E. McAssey, **NAME**, G. LeMunyan, G. Renda. *Thermal Management of a Fast UV Slitless Spectrometer for a Meteor Research Experiment*. Proc. of the ASME Summer Heat Transfer Conference, 2005, 4:721-728.

Conference Presentations

1. Symposium on Nonlinear Mechanics, Dynamics, and Control in Atomic Force Microscopy; 5th International Conference on Micro- and Nanosystems; ASME 2011 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, Washington, DC, Aug. 28 -31, 2011.
2. Nanotribology Technical Session; STLE 66th Annual Meeting & Exhibition, Atlanta, GA, May 15-19, 2011.