

# Zayd Chad Leseman

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Native Language: English (US)

Work: (505) 277-4940

Citizenship: US citizen

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**Objective** To develop and sustain a successful research and teaching program in the area of materials behavior with an emphasis on MEMS and nano-technology through a tenure-track position at a reputable research institution.

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**Education** **University of Illinois at Urbana-Champaign**

- ◆ **Ph.D.** in Mechanical Engineering *May 2006*  
Advisor: Thomas J. Mackin  
Dissertation: A Novel MEMS Based Load Cell for Mechanical Testing of Nano-scale Membranes
- ◆ **M.S.** in Mechanical Engineering *May 2000*  
Advisor: Taher A. Saif  
Thesis: Adhesion Studies of a Single Living Cell Using MEMS Sensors
- ◆ **B.S.** in Mechanical Engineering *December 1997*

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**Professional Experience** **Assistant Professor** *2006-Present*  
The University of New Mexico – ME Department

- ◆ Developing novel techniques for nanoscale materials testing
- ◆ Designing new apparatuses for deposition and etching of materials
- ◆ Innovating and teaching courses
- ◆ Advising graduate students

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**Research Experience** **Doctoral Research** *2002-2006*  
University of Illinois at Urbana-Champaign M&IE Department

- ◆ Developed novel MEMS load cell to determine mechanical properties of nano-thickness films
- ◆ Designed and built HF vapor etch station
- ◆ Designed and built XeF<sub>2</sub> vapor etch station
- ◆ Modeled and validated a method for the repair of stiction failed microcantilevers using laser induced stress waves
- ◆ Measured the strain energy release rate of stiction failed microcantilevers using a single cantilever peel test
- ◆ Designed and built an apparatus to determine film-thickness in-situ using an optical technique
- ◆ Assisted in writing of grants to government agencies
- ◆ Managed four undergraduate research assistants
- ◆ Maintained the Plasma Therm 770 System Deep Reactive Ion Etcher

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**Chief Technical Officer** *1999-2002*  
Gattaca Technologies, Inc. Houston, TX

- ◆ Invented and patented (see Patent Section below) novel MEMS pumps for inkjet printing applications
- ◆ Designed and fabricated prototype pumps
- ◆ Developed bonding techniques for MEM structures
- ◆ Raised capital by giving presentations to potential investors
- ◆ Identified biological application and wrote grant to the NIH in collaboration with Prof. Haymond M.D. from Baylor University College of Medicine
- ◆ Designed, located, purchased, and constructed in-house testing laboratory
- ◆ Negotiated testing agreements
- ◆ 1<sup>st</sup> place Feasibility Plan Competition; campus wide competition for entrepreneurs and won \$500

**Master of Science Research**

1998-2000

University of Illinois at Urbana-Champaign M&amp;IE Department

- ◆ Tested single cells' and mice embryos' mechanical properties using MEMS
- ◆ Actuated MEM structures in a liquid to glean damping coefficients and dielectric constants
- ◆ Purchased, designed, machined, and setup in-house laboratory, including a biological section
- ◆ Set up protocols for the culturing of cells
- ◆ Design and built high voltage amplifier
- ◆ Built a probe station
- ◆ Designed and machined novel test apparatuses

**Undergraduate Research Assistant**

1997

University of Illinois at Urbana-Champaign M&amp;IE Department

- ◆ Designed, purchased, and built an apparatus to interface MEMS to biological materials for mechanical behavior testing
- ◆ Fixtured MEMS devices for testing of biological and inorganic substances

**Mechanical Engineering Intern**

Summer '95, '96, '97

Cummins Engine Company Inc. Columbus, IN

- ◆ Conducted research on alternative fuels to run in existing diesel engines
- ◆ Designed and constructed test bench for determining the amount of air trapped in diesel fuel
- ◆ Supervised in-field diagnostics for Alternative Fuels Division (LPG, CNG, and LNG engines)
- ◆ On-site testing of prototype LPG engines
- ◆ Organized the CO-OP Challenge, an athletic event for over 15 companies

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**Teaching Experience****Graduate Teaching Assistant**

1999-Present

University of Illinois at Urbana-Champaign M&amp;IE Department

ME 498 Intro to MEMS Lab

- ◆ Student Evaluation: OUTSTANDING (in top 10% of instructors at University)
- ◆ Head TA for course
- ◆ Directed students in the fabrication of a MEMS pressure sensor and microfluidic circuit
- ◆ Developed new process for fabrication of the microfluidic circuit thus taking the yield from 30% in previous semesters to 95% with my process

ME 330 Materials Behavior Lab (2 semesters)

- ◆ Student Evaluation: EXCELLENT (in top 30% of instructors at University)
- ◆ Head TA for course
- ◆ Conducted experiments into: solidification, impact, welding, stress-strain relations, microstructure, hardness, heat treatments

ME 320 Heat Transfer

- ◆ Student Evaluation: OUTSTANDING (in top 10% of instructors at University)
- ◆ Conducted and supervised experiments

ME 471 Finite Element Analysis (Grader)

- ◆ Wrote code for truss and heat transfer analysis using MatLab
- ◆ Implemented ANSYS in stress analysis problems
- ◆ Wrote a mesh generator in MatLab for 3-node triangular heat transfer elements

ME 550 Solidification Processing (Grader)

- ◆ Solved and created homework solutions

**Calculus and Mathematica Teaching Assistant**

1995-1996

University of Illinois at Urbana-Champaign Mathematics Department

- ◆ Computer Lab teaching assistant
- ◆ Graded Calculus II and III homework

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- Awards**
- Silver Award, MRS student paper competition 2005
  - Finalist, SEM student paper competition 1999
  - 1<sup>st</sup> place Feasibility Plan Competition; campus wide competition for entrepreneurs and won \$500
  - 2<sup>nd</sup> place Cutler-Hammer Design Competition; designed new type of circuit breaker, won \$5k
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- Patents**
1. "Liquid Delivery System," Issued April 2, 2002, Patent No.: US 6,364,460 B1
  2. "Apparatus and Method for Determining a Thickness of a Deposited Material," Issued Nov. 10, 2005, Pub. No.: US 2005/0247877 A1.
  3. "System and Method for Mechanical Testing of Freestanding Microscale to Nanoscale Thin Films," Issued Aug 24, 2006, Pub. No. US 2006/0186874 A1
  4. "Microfabricated real-time chemical or biochemical sensor having a deflecting membrane," provisional application 1201.75690.
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### Journal Publications

1. M. T. A. Saif, C. R. Sager<sup>\*</sup>, and S. Coyer, "A functionalized bioMEMS sensor for force response study at local adhesion sites of single living cells on a substrate," *Annals of Biomedical Engineering*, 31:8, 950-961, 2003.
  2. Z. C. Leseman and T. J. Mackin, "Determination of the mechanical properties of freestanding nano-thickness gold membranes using a novel MEMS based load cell," *Sensors & Actuators A*, vol. 134, pp. 264-270, 2007. **(Invited)**
  3. Z. C. Leseman, S. Carlson, T. J. Mackin, "Experimental measurements of the strain energy release rate for stiction failed microcantilevers using a single cantilever beam peel test," *Journal of Microelectromechanical Systems*, vol. 16, no. 1, pp. 38-43, 2007.
  4. A. A. Savkar, K. D. Murphy, Z. C. Leseman, T. J. Mackin, and M. R. Begley, "On the use of structural vibrations to release stiction failed MEMS," *Journal of Microelectromechanical Systems*, , vol. 16, no. 1, pp. 163-173, 2007.
  5. Z. C. Leseman, S. Koppaka, T. J. Mackin, "A fracture mechanics description of stress wave repair in stiction-failed microcantilevers: Theory and experiments," *Journal of Microelectromechanical Systems*, to appear.
  6. Z. C. Leseman and T. J. Mackin, "A novel method for the calibration of MEMS load cells," to be submitted.
  7. G. Horn, Z. C. Leseman, D. Reineger, T. J. Mackin, "Trapped mesas and particle in wafer bonded Si part II: Experimental determination of residual stress and debond size," to be submitted.
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### Refereed Conference Proceedings

1. C. Sager\* and T. Saif, "Capillary forces at the interface of a MEMS actuator," in *Proc. ASME Micro-Electro-Mechanical Systems (MEMS)*, 1999, pp. 365-370.
2. C. R. Sager\*, P. LeDuc and M. T. A. Saif, "Adhesion study of a single living bovine endothelial cell using a MEMS sensor," in *Proc. ASME Micro-Electro-Mechanical Systems (MEMS)*, 2000, H01187.
3. T. Saif, C. Sager\*, S. Coyer, "Force response of single living cells due to localized deformation," in *Proc. ASME Micro-Electro-Mechanical Systems (MEMS)*, 2002, pp. 591-593.
4. Z. C. Leseman, Z. Sheikh, T. J. Mackin, M. Begley, "Mechanical testing of freestanding nano-films using a novel finite diameter tip MEMS-based testing machine," in *Proceedings of the IEEE International Conference on Micro Electro Mechanical Systems (MEMS)*, v 7 MEMS, 2005, p 473-477.
5. Z. C. Leseman, S. Koppaka, T. J. Mackin, "A fracture mechanics model for the repair of microcantilevers by laser induced stress waves," in *Proceedings of the IEEE International Conference on Micro Electro Mechanical Systems (MEMS)*, v 7 MEMS, 2005, p 353-358.
6. S. Mariserla, Z. C. Leseman, T. J. Mackin, "A novel glucose sensor based on deflection of a thin membrane," in *Proceedings of the IEEE International Conference on Micro Electro Mechanical Systems (MEMS)*, v 7 MEMS, 2005, p 479-480.
7. Z. C. Leseman, H.K. Jeong, T. J. Mackin, R. Masel and M. R. Begley "Measurements of the mechanical properties of freestanding nanoscale membranes," in *Proceedings ASME Micro-ElectroMechanical Systems (MEMS) 2006*, IMECE2006-14463, 2006.

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\* Note: Author legally changed his name in 2004 from Chad Randall Sager to Zayd Chad Leseman.

8. Z. C. Leseman, S. P. Carlson, X. Xue, and T. J. Mackin, "A standard approach for measuring adhesion energies in stiction-failed microdevices," in *Proceedings ASME Micro-ElectroMechanical Systems (MEMS)2006*, IMECE2006-14498, 2006.
  9. B. R. Flachsbart, S. Prakash, J. Yeom, Y. Wu, G. Z. Moszgai, Z. C. Leseman, K. Wong, C. Connell, E. J. Correa, M. R. Hansen, and M. A. Shannon "Theory, Fabrication, and Characterization of MEMS Devices: An Interdisciplinary Course for Mechanical Engineers," in *Proceedings ASME Micro-ElectroMechanical Systems (MEMS) 2006*, IMECE2006-13741, 2006.
  10. Z. C. Leseman, H.K. Jeong, T. J. Mackin, R. Masel and M. R. Begley "Experimental Measurements of the Mechanical Properties of Freestanding Nano-Films," in *Proceedings ICBN*, to appear.
  11. Z. C. Leseman, T. Khraishi, S. P. Carlson, X. Xue, and T. J. Mackin, "Measurements of the Adhesion Energies in Stiction-Failed MEMS," in *Proceedings of the ICBN*, to appear.
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### Conference Proceedings

1. C. R. Sager\* and M. T. A. Saif "An optical microscopy system for experiments on the microscale," in *Proc. of the 1999 Student Paper Competition of the SEM Annual Conference on Theoretical, Experimental and Computational Mechanics*, 1999, pp. 19-21.
  2. C. R. Sager\*, P. LeDuc and T. Saif, "In-situ adhesion studies of a single living bovine endothelial cell using MEMS sensor," in *Proc. of the 1st Annual Int. IEEE-EMBS Special Topics Conf. on Microtechnologies in Medicine and Biology*, Oct. 12-14, 2000, Palais des Congress, Lyon, France, pp 76-79.
  3. C. R. Sager\* and Thomas J. Mackin, "In-situ deposition measurement of thin film thickness using a novel 2-D Optical Method," in *Proc. of the 2004 SEM X Int. Cong. and Expo. on Experimental and Applied Mech.*, 2004, pp. 265-270.
  4. Z. C. Leseman, Z. Sheikh, T. J. Mackin, M. Begley, "Mechanical testing of freestanding nano-films using a novel finite diameter tip MEMS-based testing machine," in *2005 Proceedings of the 4th ASME Conference on Integrated Nanosystems: Design, Synthesis, and Applications, Proceedings of the 4th ASME Integrated Nanosystems Conference: Design, Synthesis, and Applications*, 2005, p 9-10.
  5. S. Mariserla, Z. Leseman, T. J. Mackin, "Real-Time glucose sensing using a MEMS-based bi-material deflecting membrane," in *Proceedings of Frontiers in Biomedical Devices Conference, NanoBio06*, v 2006, *Proceedings of Frontiers in Biomedical Devices Conference, NanoBio06*, 2006, 2p.
  6. D. Reiniger, G. Horn, T. J. Mackin, J. R. Lesniak, Y. Chu, Y. Zhong, and Z. C. Leseman, "Experimental residual stress mapping for bonded semiconductor devices," in *Proc. Of the 2007 SEM X Int. Cong. and Expo. on Experimental and Applied Mechanics*, to appear.
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### References

**Matthew Begley**, Associate Professor of Civil Engineering and Materials Science and Engineering, The University of Virginia, **Phone:** (434) 243-8728, **e-mail:** [begley@virginia.edu](mailto:begley@virginia.edu)

**Thomas Mackin**, Professor and Chair of the Department of Mechanical Engineering, Cal Poly, **Phone:** (805) 756-1334, **e-mail:** [tmackin@calpoly.edu](mailto:tmackin@calpoly.edu)

**Taher Saif**, Associate Professor of Mechanical and Industrial Engineering University of Illinois Urbana-Champaign, **Phone:** (217) 333-8552, **e-mail:** [saif@uiuc.edu](mailto:saif@uiuc.edu)

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