

ERIN E. FLATER

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Education

Ph.D. Engineering Mechanics, University of Wisconsin-Madison, 2006

M.S. Engineering Mechanics, University of Wisconsin-Madison, 2003

B.A. Physics, Spanish, Luther College, Decorah, IA, 2001

Employment

Associate Professor of Physics, Luther College, August 2012 – present.

Assistant Professor of Physics, Luther College, August 2006 – August 2012.

Postdoctoral Research Associate, University of Wisconsin-Madison, June – July 2006.

Contract Student, Sandia National Laboratories, Albuquerque, NM, June/July 2003.

Graduate Research Assistant, University of Wisconsin-Madison, June 2001 – May 2006.

Grants and Awards

- National Science Foundation-Research Experience for Undergraduates supplemental grant, \$6,000, June-July 2011.
- National Science Foundation-Research at Undergraduate Institutions (NSF-RUI) collaborative grant, \$199,921, May 2009-May 2012.
- National Science Foundation-Major Research Instrumentation (NSF-MRI) grant, \$158,983, Aug 2007-Aug 2008.
- National Science Foundation Graduate Research Fellow 2002-2006.
- Graduate student presentation competition finalist, SNLP session of the APS March Meeting, Baltimore, MD, 2006.
- Graduate student poster award, AVS Surface Analysis Conference, Urbana, IL, 2003.
- Herman E. Ellingson Prize in Physics, Luther College, Decorah, IA, 2000.

Teaching interests

My areas of teaching expertise are in the areas of classical mechanics and deformable-body mechanics. Specifically I teach the only two engineering-type courses at Luther College (Statics and Mechanics of Materials), which prepare numerous students for future careers in engineering.

Research interests

My research pursuits include the investigation of the fundamental mechanisms of friction at the nanoscale using an instrument called the Atomic Force Microscope. My research students and I focus on the friction properties of model materials, seeking potential candidates for micromachine applications. My current work focuses on the friction and wear behavior of metal oxide surfaces. I am also interested in Atomic Force Microscope tip characterization.

Courses taught at Luther College

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| • Physics 114: Physics of Sound | • Physics 352: Mechanics of Materials |
| • Physics 152: General Physics | • Physics 361: Classical Mechanics |
| • Physics 151,152,181,282 lab sections | • Science 111: Physical Science |
| • Physics 238: Statics | • Science 125: Great Ideas in Natural Science |
| • Physics 281: Modern Physics I | • Honors 320: Modernity and Science |

Publications and Presentations

Peer-reviewed journal articles

E.E.Flater, G.E.Zacharakis-Jutz*, B.G.Dumba*, I.A.White*, C.Clifford, "Toward easy and reliable AFM tip shape determination using blind tip reconstruction", *Ultramicroscopy*, 146 (2014), p.130-146.

*Luther College undergraduate student co-authors

E.E.Flater, W.R.Ashurst, R.W.Carpick "Nanotribology of octadecyltrichlorosilane monolayers and silicon: Self-mated vs. unmated interfaces and local packing density effects", *Langmuir* 23 (2007) p.9242-9252.

E.E.Flater, A.D.Corwin, M.P.de Boer, R.W.Carpick, "In-situ wear studies of surface micromachined interfaces subject to controlled loading", *Wear* 260, 6 (2006), p.580-593.

D.S.Grierson, **E.E.Flater**, R.W.Carpick, "The JKR-DMT transition as applied to Atomic Force Microscopy measurements", *Journal of Adhesion Science and Technology* 19, 3-5 (2005) p. 291-311.

C.K.Bora, **E.E.Flater**, M.D.Street, J.M.Redmond, M.J.Starr, R.W.Carpick, M.E.Plesha, "Multiscale Roughness and Modeling of MEMS Interfaces", *Tribology Letters* 19, 1 (2005) p.37-48.

R.W.Carpick, **E.E.Flater**, K.Sridharan, D.F.Ogletree, M.Salmeron, "Atomic scale friction and its connections to fracture mechanics", *JoM* 56,10 (2004) p.48-52.

Book chapters

D.S.Grierson, **E.E.Flater**, R.W.Carpick, "The JKR-DMT transition as applied to Atomic Force Microscopy measurements", in Atomic Force Microscopy in Adhesion Studies, Eds. J.Drelich and K.L.Mittal, Brill/VSP, Leiden-Boston: 2005, p. 75-95.

Conference proceedings

B. Borovsky, **E.E.Flater**, "Research at Undergraduate Institutions (RUI): Collaborative Research: The Molecular Origins of Friction - A study across velocity regimes of phosphonate monolayers on alternative MEMS-type surfaces", Proceedings of 2011 NSF Engineering Research and Innovation Conference, Atlanta, GA (2011).

R.W.Carpick, **E.E.Flater**, M.D.Street, E.D.Reedy Jr., A.D.Corwin, M.P.de Boer, *Proceedings of World Tribology Congress III*, Washington, D.C.(2005).

E.D.Reedy Jr., M.J.Starr, R.E.Jones, **E.E.Flater**, R.W.Carpick. "Contact Modeling of Sam-Coated Polysilicon Asperities", *28th Annual Meeting of The Adhesion Society*, Mobile, AL (2005).

M.J.Starr, E.D.Reedy,Jr., A.D.Corwin, R.W.Carpick, **E.E.Flater**, "Contact Mechanics Description of Inelastic Displacement Response of a Nano-Positioning Device", *International Conference on MEMS,NANO and Smart Systems*, Banff, Alberta, Canada (2005).

C.K.Bora, M.E.Plesha, **E.E.Flater**, M.D.Street, R.W.Carpick, "Multiscale roughness of MEMS surfaces", *Proceedings of the ASME/STLE Joint International Tribology Conference*, Long Beach, CA (2004).

M.J.Starr, H.Sumali, J.M.Redmond, **E.E.Flater**, and R.W.Carpick, "Analysis of Contact Forces Using AFM Data of Polycrystalline Silicon Surfaces", *Proceedings of the Society for Experimental Mechanics Annual Conference*, Costa Mesa, CA (2004).

E.E.Flater, M.D.Street, C.K.Bora, M.E.Plesha, A.D.Corwin, M.P.de Boer, R.W.Carpick, "Multi-scale behavior of friction in MEMS: Can we predict friction and failure?", *Proceeding of the Society for Experimental Mechanics Annual Conference*, Costa Mesa, CA (2004).

R.W.Carpick, **E.E.Flater**, K.Sridharan, "The effect of surface chemistry and structure on nano-scale adhesion and friction", *Polymeric Materials: Science & Engineering* (from the *ACS National Meeting*) 90 (2004) p.197-198.

E.E.Flater, J.R.VanLangedon, E.H.Wilson, K.Sridharan, R.W.Carpick, "Frictional and adhesive properties of Diamond-like Carbon/ Silicon Nitride Nanocontacts", *Proceedings of the Society for Experimental Mechanics Annual Conference*, Milwaukee, WI, 725 (2002).

R.W.Carpick, **E.E.Flater**, J.R.VanLangendon, M.P.de Boer, "Friction in MEMS: From Single to Multiple Asperity Contact", *Proceedings of the Society for Experimental Mechanics Annual Conference*, Milwaukee, WI, 725 (2002).

Other articles

E.E.Flater, "Student and Advisor", *Radiations: The official publication of Sigma Pi Sigma*, Spring 2014.

Presentations/ Posters *Undergraduate student co-author(s)

Presentation*: AVS 62 nd International Symposium, San Jose, CA	Oct 2015
Poster*: Gordon Research Conference on Tribology, Waltham, MA	July 2014
Presentation*: AVS 59 th International Symposium, Tampa, FL	Oct 2012
Poster: "Beyond the First Year" Advanced Lab Conference, Philadelphia, PA	July 2012
Poster*: Gordon Research Conference on Tribology, Waterville, ME	July 2012
Poster*: AVS 58 th International Symposium, Nashville, TN	Nov 2011
Poster*: NSF CMMI Grantees Conference, Atlanta, GA	Jan 2011
Presentation: St. Olaf Physics Department Colloquium, Northfield, MN	Nov 2010
Presentation*: AVS 57 th International Symposium, Albuquerque, NM	Oct 2010
Poster*: Gordon Research Conference on Tribology, Waterville, ME	June/July 2010
Presentation: Mankato State University Physics Dept. Colloquium, Mankato, MN	April 2009
Presentation: Auburn University Chem Engr. Dept. Colloquium, Auburn, AL	March 2009
Poster*: Gordon Research Conference on Tribology, Waterville, ME	July 2008
Presentation: Univ. of N. Iowa Physics Dept. Colloquium, Cedar Falls, IA	Nov 2007
Presentation: St. Olaf Physics Department Colloquium, Northfield, MN	March 2007
Presentation: American Physical Society March Meeting, Denver, CO	March 2007
Poster: Gordon Research Conference on Tribology, Waterville, ME	June 2006
Presentation: American Physical Society March Meeting, Baltimore, MD	March 2006
Presentation: AVS 52 nd International Symposium, Boston, MA	Oct/Nov 2005

Presentation: Physical Electronics Conference, Madison, WI	June 2005
Presentation: American Physical Society, Los Angeles, CA	Apr 2005
Presentation: AVS 51 st International Symposium, Anaheim, CA	Nov 2004
Poster: Gordon Research Conference on Tribology, Bristol, RI	June/July 2004
Poster: Materials Research Society Symposium, Boston, MA	Dec 2003
Presentation: Society of Engineering Science Conference, Ann Arbor, MI	Oct 2003
Poster: AVS Surface Analysis Conference, Urbana, IL	June 2003
Poster: Nano All Around Us Conference, Madison, WI	May 2003
Presentation: Amer. Soc. of Mech. Engr. Conference, New Orleans, LA	Nov 2002
Poster: Gordon Research Conference on Tribology, Bristol, RI	Aug 2002
Presentation: Soc. of Experimental Mechanics Conference, Milwaukee WI	June 2002

Research/senior project student advising

- Jayse Weaver '16, research student, Summer 2015-Spring 2016.
- Jesse Hitz Graff '16, research student, Fall 2014-Spring 2016.
- Steven Sorenson '15, research/senior project student: Summer 2013-present; Poster presentation at the Gordon Research Conference on Tribology, July 2014.
- Erik Linn-Molin '14, research/senior project student: Summer 2012-Fall 2013; Senior Project: "A tribological investigation of aluminum oxide using the atomic force microscope"; Poster presentation at the Gordon Research Conference on Tribology, July 2012.
- John Klungtvedt '13, Senior Project: "Friction of HPPD coated Materials using Lateral Force Microscopy", Fall 2012-Spring 2013.
- John Humpal '12, Senior Project: "An investigation on the inconsistencies in an Introductory Physics lab experiment on fluid pressure", Fall 2011-Spring 2012.
- George Zacharakis-Jutz '11, Senior Project: "Blind Tip Reconstruction: Determining the shape of an atomic force microscope tip", Fall 2010-Spring 2011.
- Egor Khaydarov, Russian exchange student, research student: Fall 2010; project: "Investigation of frictional properties of self-assembled monolayer coated aluminum oxide surfaces using integrated probes".
- Sarice Barkley '12 (St. Olaf student), research student: Summer 2010; project: "Determination of Atomic Force Microscope spring constants", Poster presentation at the Gordon Research Conference on Tribology, June/July 2010.
- Opeoluwa Matthews '12, research student: January 2010-Fall 2011; project: "Investigation of frictional properties of self-assembled monolayer coated aluminum oxide surfaces"; Poster presentation at the Gordon Research Conference on Tribology, June/July 2010; Presentation at the Midstates Consortium Undergraduate Research Symposium in the Physical Sciences, Mathematics and Computer Science at Washington University in St. Louis, Nov 2010.
- Braulio Dumba '11, research student: Summer 2008-Summer 2010; project: "Development of MatLab-based Atomic Force Microscope tip reconstruction algorithms"; Poster presentation at the Gordon Research Conference on Tribology, June/July 2010.
- Brian Nowosatka '11, research student: Summer 2009, project: "Fabrication and characterization of colloidal probes".
- Jared Wilkins '09, research student: Spring 2008-Summer 2009, Senior Project: "Investigation into Atomic Force Microscope Techniques: Rectangular Cantilever Force Calibration & Colloidal Probe Attachment".

- Aaron Zutz '08, Senior Project: "A Structural Analysis of the Sampson-Hoffland South Mechanical Penthouse" Fall 2007 - Spring 2008.
- Isaac A. White '08, research student Summer 2007 - Summer 2008, Senior Project: "Atomic Force Microscope Tip Reconstruction Algorithms and Methods For Determining Tip Geometry"; Poster presentation at the Midstates Consortium Undergraduate Research Symposium in the Physical Sciences, Mathematics and Computer Science at Washington University in St. Louis, Nov 2007.

Pedagogical development

- Awarded Teaching Partnership with Brooke Shields, faculty in Biology, Spring 2014.
- "Re-energize, re-imagine, and re-invest!" Midcareer Faculty Development Workshop, Midstates Consortium for Math and Science, Augustana College, Feb 18-20, 2011.
- "Grading for the Sake of Learning" Workshop, Luther College, Aug 17-18, 2010.
- New Physics Faculty Workshop, American Association of Physics Teachers, American Center for Physics, Nov 6-9, 2008.
- New Faculty Workshop, Pew Midstates Science and Mathematics Consortium, Hope College, July 14-16, 2006.
- "Teaching in the College Classroom" course, Engineering Professional Development 654, University of Wisconsin-Madison, June 2005.

Service to Luther College

- Assessment Committee, Fall 2012 – Spring 2014.
- Honors Advisory Committee, Fall 2012– Spring 2014.
- Harassing Conduct Officer, Summer 2008 – Spring 2014.
- Society of Physics Students local chapter advisor, Fall 2009 – Spring 2014.
- First year advising program, Fall 2007 - Fall 2008, Fall 2010 – Fall 2013.
- Scholar day workshops, "Seeing the Nanoscale", Feb 2007, 2009, 2011, 2013.
- Women and Gender Studies Board, Fall 2009 – Spring 2012.
- Teagle Assessment Meeting, Augustana College, June 4-7, 2009.
- Community Assembly, Fall 2008 – Spring 2009.
- Environmental Studies search committee for Geology faculty member, Fall 2007.
- Attended ACAD conference "Promoting the Liberal Sciences: Science as Liberal Education", Oct. 25-27, 2007.

Service to the greater science community

- Served on organizing committee for Beyond the First Year Advanced Laboratory Conference 2, July 2015

Current Professional Memberships

American Association of Physics Teachers
American Physical Society
American Vacuum Society
Phi Beta Kappa: Liberal Arts Honors Society
Sigma Pi Sigma: Physics Honors Society

Referee work for peer-reviewed journals

2002-present

Applied Physics Letters, Experimental Mechanics, Journal of Chemical Physics, Journal of Micromechanics and Microengineering, Journal of Physical Chemistry, Journal of Physics: Condensed Matter, Journal of Physics D: Applied Physics, Journal of Tribology, Journal of

Vacuum Science and Technology, Langmuir, Measurement Science and Technology, Review of Scientific Instruments, RSC Advances, Sensors, Scanning, Surface Science, Thin Solid Films, Tribology Letters, Tribology International