

## **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 have prepared numerous students for careers in engineering.

### ***Courses taught at Luther College***

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| <ul style="list-style-type: none"><li>• Physics 114: Physics of Sound</li><li>• Physics 152: General Physics 2</li><li>• Physics 182: Classical Physics 2</li><li>• Physics 185: Relativity, Quantum, and All That (will teach Jan 2019)</li><li>• Physics 238: Statics</li><li>• Physics 281: Modern Physics 1</li></ul> | <ul style="list-style-type: none"><li>• Physics 151, 152, 181, 182, 281, 282 lab sections</li><li>• Physics 312: Advanced Laboratory</li><li>• Physics 352: Mechanics of Materials</li><li>• Physics 361: Classical Mechanics</li><li>• Science 111: Physical Science</li><li>• Science 125: Great Ideas in Natural Science</li><li>• Honors 320: Modernity and Science</li></ul> |
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### **Research interests**

My research pursuits include the investigation of the fundamental mechanisms of friction and wear 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, and developing advanced material characterization methods for liberal arts college researchers.

### **Publications and Presentations** (\*Undergraduate student co-authors)

#### **Peer-reviewed journal articles**

**E.E.Flater**, J.D.Barnes\*, J.A.Hitz Graff\*, J.M.Weaver\*, N.Ansari, A.R.Poda, W.R.Ashurst, S.Khanal, T.D.B.Jacobs, "A simple atomic force microscope-based method for quantifying wear of sliding tips", *Review of Scientific Instruments*, in press-- expected publication Nov (2018).

**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.

**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, DC (2005).

E.D.Reedy Jr., M.J.Starr, R.E.Jones, **E.E.Flater**, R.W.Carpick. "Contact Modeling of Sam-Coated Polysilicon Asperities", *28<sup>th</sup> 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**, "The importance of engaging with the wider world during a sabbatical", *Agora: The Liberal Arts at Luther College*, 28, 2 (2016) p.13-15.

**E.E.Flater**, "Student and Advisor", *Radiations: The official publication of Sigma Pi Sigma*, Spring 2014, p.15.

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

Poster*: Gordon Research Conference on Tribology, Lewiston, ME	June 2018
Presentation*: STLE Annual Meeting, Minneapolis, MN	May 2018
Poster*: Gordon Research Conference on Tribology, Lewiston, ME	June 2016
Presentation: Luther College Faculty Research Symposium, Decorah, IA	Oct 2016
Presentation: Grinnell College Physics Department Colloquium, Grinnell, IA	Oct 2016
Presentation*: AVS 62 <sup>nd</sup> International Symposium, San Jose, CA	Oct 2015

Poster*: Gordon Research Conference on Tribology, Waltham, MA	July 2014
Presentation: Grinnell College Physics Department Colloquium, Grinnell, IA	Apr 2013
Presentation*: AVS 59 <sup>th</sup> 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 <sup>th</sup> 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 <sup>th</sup> 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 <sup>nd</sup> 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 <sup>st</sup> 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**

- Ben Davidson '20, research student, Fall 2018.
- Lucas Ruge-Jones '19, research student/ senior project student, Summer 2018-present.
- Keegan Danielson '19, research student/ senior project student, Summer 2017-present.
- Gannon Jordahl, senior project student, Fall 2017-Spring 2018.
- Mikaela Kovarik '18, senior project student, Fall 2017-Spring 2018.
- Jared Barnes '17, research student/ senior project student, January 2017-Fall 2017.
- Caleb Anderson '17, research student/ senior project student, Fall 2016-Spring 2017.
- Alexa Schroeder '17, senior project student, Fall 2016-Spring 2017.
- Jayse Weaver '16, research student/ senior project student, Summer 2015-Spring 2016; Poster presentation at the Midstates Consortium Undergraduate Research Symposium in the Physical Sciences, Mathematics and Computer Science at University of Chicago, Nov 2015.
- Jesse Hitz Graff '16, research student/senior project student, Fall 2014-Spring 2016. Oral presentation at the Midstates Consortium Undergraduate Research Symposium in the Physical Sciences, Mathematics and Computer Science at University of Chicago, Nov 2015.

- Steven Sorenson '15, research student/senior project student Summer 2013-Spring 2015; Poster presentation at the Gordon Research Conference on Tribology, July 2014.
- Erik Linn-Molin '14, research student/senior project student: Summer 2012-Fall 2013; Poster presentation at the Gordon Research Conference on Tribology, July 2012.
- John Klungtvedt '13, senior project student Fall 2012-Spring 2013.
- John Humpal '12, senior project student Fall 2011-Spring 2012.
- George Zacharakis-Jutz '11, senior project student Fall 2010-Spring 2011.
- Egor Khaydarov, Russian exchange student, research student Fall 2010.
- Sarice Barkley (St. Olaf student, graduated 2012), research student Summer 2010; Poster presentation at the Gordon Research Conference on Tribology, June/July 2010.
- Opeoluwa Matthews '12, research student January 2010-Fall 2011; Poster presentation at the Gordon Research Conference on Tribology, June/July 2010; Oral 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; Poster presentation at the Gordon Research Conference on Tribology, June/July 2010.
- Brian Nowosatka '11, research student Summer 2009.
- Jared Wilkins '09, research/senior project student Spring 2008-Summer 2009.
- Aaron Zutz '08, Senior Project, Fall 2007-Spring 2008.
- Isaac A. White '08, research student Summer 2007-Summer 2008; 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 Midsates 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 the Luther College Physics Department**

- Pre-engineering advisor, Fall 2007 – present.
- Organizer for the Physics Department Colloquium, Fall 2015 – Spring 2018.
- Shared responsibility for upkeep of the Physics Library and Exploration Center, Fall 2009 – present.
- Shared responsibility for upkeep of the Physics Department and Pre-Engineering websites, Spring 2008 – Summer 2017.
- Society of Physics Students/ Sigma Pi Sigma local chapter advisor, Fall 2009 – Spring 2014, Fall 2017 – present.

### **Service to Luther College**

- APC (CPR subcommittee), Spring 2018-present. Chair of Course and Program Review (CPR) subcommittee Fall 2018.

- Eportfolio committee (part of the Sophomore Initiative), Fall 2017–present. Chair of committee Fall 2018.
- Harassing Conduct Officer, Summer 2008 – Spring 2014, Fall 2017-present.
- Quality Initiative Oversight Committee, the Next Steps for Sophomores Program, Fall 2016 – Spring 2017.
- Women and Gender Studies Board, Fall 2009 – Spring 2012, Fall 2015 – Spring 2018.
- First year advising program, Fall 2007 – Fall 2008, Fall 2010 – Fall 2013, Fall 2015 – present.
- Higher Learning Commissions Quality Initiative Development Committee, Fall 2015 – Spring 2016.
- Honorary Degrees Committee, Fall 2015 – Spring 2016.
- Scholar day workshops, “Seeing the Nanoscale”, Feb 2007, 2009, 2011, 2013, 2016.
- Assessment Committee, Fall 2012 – Spring 2014.
- Honors Advisory Committee, Fall 2012– Spring 2014.
- 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 Physics community**

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

#### ***Current Professional Memberships***

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

#### **Review panel work for the National Science Foundation**

4 different review panels: first one in 2009, latest one in 2018

#### **Referee work for peer-reviewed journals                      2002-present**

American Journal of Physics, Applied Sciences, 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, Microscopy and Microanalysis, Nano, Nanotechnology, Review of Scientific Instruments, RSC Advances, Sensors, Scanning, Surface Science, Thin Solid Films, Tribology Letters, Tribology International, Ultramicroscopy