BRIAN P. BOROVSKY
Curriculum Vitae

St. Olaf College
Department of Physics
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I. EDUCATION

1998	Ph.D. in Physics	University of Minnesota	Minneapolis, MN
1994	B.A. *summa cum laude* in Physics and Mathematics	St. Olaf College	Northfield, MN

Doctoral dissertation: *Studies of diffusion, homoepitaxial growth, and hydrocarbon adsorption on Si(001) with scanning tunneling microscopy and atom tracking*

Areas of expertise: Surface Science, Friction, Micro/Nano Tribology, Scanning Probe Microscopy, Nanoindentation, Quartz Crystal Microbalance

II. PROFESSIONAL APPOINTMENTS AND TEACHING EXPERIENCE

2005 – present	Assistant Professor of Physics St. Olaf College, Northfield, MN
2001 – 2005	Assistant Professor of Physics Grinnell College, Grinnell, IA
1999 – 2001	Postdoctoral Research Associate North Carolina State University Advisor: Dr. Jacqueline Krim, Department of Physics
Fall 1998	Visiting Assistant Professor of Physics St. Olaf College

Courses Taught at St. Olaf College

Fall 2007		**Spring 2008**	
Analytical Physics III with laboratory	228	Principles of Physics II with laboratory sections	125
Quantum Mechanics	376	Advanced Physics Lab	385
		Electronics w/ Lab	246
Fall 2006		**Spring 2007**	
Analytical Physics III with laboratory	228	Principles of Physics II with laboratory sections	125
Quantum Mechanics	376	Advanced Physics Lab	385
Fall 2005		**Spring 2006**	
Analytical Physics III with laboratory	228	Principles of Physics II with laboratory sections	125
		Electronics w/ Lab	246

Courses Taught at Grinnell College

Fall 2003		**Spring 2004**	
Tutorial – discussion & writing		General Physics	132
Electronics w/ Lab	220	Advanced Laboratory	462
Fall 2002		**Spring 2003**	
General Physics	131	General Physics	132
Electronics w/ Lab	220	Advanced Laboratory	462
Fall 2001		**Spring 2002**	
General Physics	131	General Physics	132
Physics Lab	131	Physics Lab	132
		Special Topics	295
		Advanced Laboratory	462

III. PROFESSIONAL ACTIVITY

Grants and Fellowships Awarded

2008 **National Science Foundation.** Research grant. Multi-institution collaborative proposal with colleagues at Luther College and Auburn University. B. Borovsky (Lead PI), E. Flater(Co-PI), and W.R. Ashurst. ***RUI: Collaborative Research: The Molecular Origins of Friction - A study across velocity regimes of phosphonate monolayers on alternative MEMS-type surfaces.*** $200,000. 2009 - 2011

2004 **Grinnell College - Jack and Lucile Harris Faculty Fellowship.** Faculty release time award judged by internal and external reviewers. Provided a leave from teaching for one academic year to conduct scholarly research. B. Borovsky, ***The Molecular Origins of Friction: Alkanethiol Monolayers Studied with Combined Nanoindentation and Quartz Crystal Microbalance.*** Salary and $6000 budget for supplies and travel. 2004-2005

2002 **National Science Foundation.** Research grant. Major Research Instrumentation award for Research at Undergraduate Institutions (MRI-RUI). B. Borovsky, ***Acquisition of a Nanoindenter for Molecular-Level Studies of Friction at Grinnell College***. $82,944. 2002-2005

2002 **Research Corporation**, Tucson, AZ. Research grant. Cottrell College Science Award. B. Borovsky, ***Quartz Crystal Microbalance and Sample Chamber for Studies of the Molecular Origins of Friction in the High-Speed Regime***. $41,400. 2002-2004

Publications * denotes undergraduate researcher

Refereed journal articles published

2007 *Observation of microslip dynamics at high-speed microcontacts*, Brian Borovsky, Adam Booth*, and Erin Manlove*, Applied Physics Letters **91**, 114101 (2007).

2001 *Measuring nanomechanical properties of a dynamic contact using an indenter probe and quartz crystal microbalance*, B. Borovsky, J. Krim, S. A. Syed Asif, and K. J. Wahl, Journal of Applied Physics **90**, 6391 (2001).

2000 *Scanning tunneling microscope measurements of the amplitude of vibration of a quartz crystal oscillator*, B. Borovsky, B. Mason, and J. Krim, Journal of Applied Physics **88**, 4017 (2000).

1999 *Piecewise diffusion of the silicon dimer*, B. Borovsky, M. Krueger, and E. Ganz, Physical Review B **59**, 1598 (1999).

1999 *Scanning tunneling microscope studies of boron-doped Si(001)*" J.F. Nielsen, H.J. Im, J.P. Pelz, M. Krueger, B. Borovsky, and E. Ganz, Journal of Vacuum Science and Technology A **17**, 1670 (1999).

1998 *Scanning tunneling microscopy study of the adsorption of toluene on Si(001)*, B. Borovsky, M. Krueger, and E. Ganz, Journal of Vacuum Science and Technology B **17**, 7 (1999).

1998 *Metastable adsorption of benzene on the Si(001) surface*, B. Borovsky, M. Krueger, and E. Ganz, Physical Review B **57,** R4269 (1998).

1997 *Diffusion of the Silicon Dimer on Si(001): New Possibilities at 450 K*, B. Borovsky, M. Krueger, and E. Ganz, Physical Review Letters **78**, 4229 (1997).

1997 *Diffusion of adsorbed Si dimers on Si(001)*, M. Krueger, B. Borovsky, and E. Ganz, Surface Science **385,** 146 (1997).

1995 *Si(001) Step Dynamics*, C. Pearson, B. Borovsky, M. Krueger, R. Curtis, and E. Ganz, Physical Review Letters **74**, 2710 (1995).

1995 *Hot scanning tunneling microscope study of B type step edges and small silicon islands on Si(001)*, C. Pearson, M. Krueger, R. Curtis, B. Borovsky, X. Shi, and E. Ganz, Journal of Vacuum Science and Technology A **13,** 1506 (1995).

1998 *The nuclear electric quadrupole moment of ^6Li*, J. Cederberg, D. Olson, J. Larson, G. Rakness, K. Jarausch, J. Schmidt, B. Borovsky, P. Larson, and B. Nelson, Physical Review A **57**, 2539 (1998).

1996 *The electric dipole moment and hyperfine interactions of KOH*, J. Cederberg, D. Olson, D. Rioux, T. Dillemuth, B. Borovsky, J. Larson, S. Cheah, M. Carlson, and M. Stohler, Journal of Chemical Physics **105,** 3361 (1996).

Conference proceedings

2002 *Scanning Tunneling Microscope-Quartz Crystal Microbalance Studies of "Real World" and Model Lubricants*, J. Krim, M. Abdelmaksoud, B. Borovsky, and S. M. Winder, in Dynamics and Friction in Submicrometer Confining Systems, ACS Symposium Series, vol. 882, pp. 1-18, 2004.

2000 *STM-QCM studies of vapor phase lubricants*, B. Borovsky, M. Abdelmaksoud and J. Krim, in Proceedings of the Nanotribology Workshop, Gaithersburg, MD, 2000.

1998 *Metastable structures in the initial stages of Si homoepitaxy*, B. Borovsky, M. Krueger, and E. Ganz, in Surface Review and Letters **5**, 1053 (1998).

Popular Media

2000 Postdoctoral research on microelectromechanical systems (MEMS) lubrication featured in cover story of *Science News,* July 22, 2000: "Little Engines that Couldn't," by Peter Weiss. Article for a general audience that highlighted the work of several research groups in this area.

Contributed Presentations / Abstracts * denotes undergraduate researcher

2008 *High-speed microtribology with a combined nanoindenter and quartz microbalance: From fundamentals to applications,* B. Borovsky, A. Booth*, and E. Manlove*, Gordon Conference on Tribology, Colby College, Maine, July 2008.

2006 *Observations of microslip in realistic microscopic contacts with combined nanoindentation and quartz microbalance,* B. Borovsky and A. Booth*, 53rd International Symposium of AVS - The Science & Technology Society, San Francisco, CA, Oct. 2006.

2006 *Observations of microslip in realistic microscopic contacts with combined nanoindentation and quartz microbalance,* B. Borovsky and A. Booth*, Gordon Conference on Tribology, Colby College, Maine, June 2006.

2005 *Measuring interfacial friction and structural detail with combined quartz microbalance and nanoindentation*, B. Borovsky and A. Booth*, Fall Meeting of the Materials Research Society, Boston, MA, Nov. 2005.

2005 *Combined nanoindenter and quartz microbalance studies of realistic tribological contacts and ultrathin lubricant films*, B. Borovsky and A. Booth*, 52nd International Symposium of AVS - The Science & Technology Society, Boston, MA, Oct. 2005.

2001 *Combined Nanoindenter and Quartz Crystal Microbalance Studies of Realistic Tribological Contact*, Brian Borovsky, Jacqueline Krim, S. A. Syed Asif, and Kathryn Wahl, 48th Int. Symposium of AVS - The Science & Technology Society, San Francisco, CA, 2001.

2001 *Lubrication mechanisms of tricresylphosphate, TCP, on Cr and Fe surfaces at elevated temperatures: An atomic-scale view,* Abdelmaksoud M, Borovsky B, Krim J, American Chemical Society, April 2001.

2000 *Viewing a Moving Surface Contact - An STM-QCM Study of Vapor Phase Films on Metal Surfaces*, Brian Borovsky, Mohamed Abdelmaksoud, and Jacqueline Krim, 47th National Symposium of the American Vacuum Society, Boston, Massachusetts, 2000.

1999 *Combined Quartz Crystal Microbalance and Scanning Probe Microscope Studies of Vapor-Deposited Films on Metal Surfaces,* Brian Borovsky, Mohammed

Abdelmaksoud, and Jacqueline Krim, 46th National Symposium of the American Vacuum Society, Seattle, Washington, 1999.

1998 *An atomic view of benzene on the Si(001) surface*, Brian Borovsky, Michael Krueger, and Eric Ganz, American Physical Society March Meeting, Los Angeles, California, 1998.

1996 *The Stealth Dimer***,** Brian Borovsky, Michael Krueger, and Eric Ganz, 43rd National Symposium of the American Vacuum Society, Philadelphia, Pennsylvania, 1996.

Invited Presentations (off-campus) on Research and Teaching Topics

2008 *The Origins of Friction: Micro/nanoscale studies of high speed sliding contacts with a combined nanoindenter and quartz microbalance.* A colloquium presentation to the Luther College Physics Department (April 2008)

2004 *Friction on the Atomic Scale: Revealing the Hidden Structure of Interfaces*. An invited colloquium presentation to the Iowa State University Mechanical Engineering Department (March 2004)

2003 *Getting your class involved using individual response technology*. An invited presentation at the Midwest Instructional Technology Center symposium on innovations in science teaching, DePauw University (May 2003)

2002 *Friction on the Atomic Scale: Revealing the Hidden Structure of Interfaces*. An invited colloquium presentation to the St. Olaf College Physics Department, given while I was a faculty member at Grinnell College (October 2002)

Student Research Projects Mentored at St. Olaf College

2008	Summer	Cullen O'Neill '09	Daniel Pluth '09
2007	Interim	Erin Manlove '07	
2007	Summer	Cullen O'Neill '09	Daniel Pluth '09
2006	Summer	Erin Manlove '07	
2005	Summer	Erin Manlove '07	

Student Research Projects Mentored at Grinnell College

2003	Summer	Sandra Sowah '05	
2002	Summer	Adam Booth '04	Sandra Sowah '05

Presentations by Student Researchers (other than posters and brief talks on campus)

2008 Cullen O'Neill: *Nanoscale Friction Research: Micromachines and Beyond.* Colloquium presentation to the St. Olaf College Physics Department. May 7, 2008.

2005 Erin Manlove: *An investigation of ultra thin lubricant films with integrated nanoindentation and quartz crystal microbalance*. Poster presentation at the PEW Undergraduate Research Symposium. St. Louis, MO. November 2005.

Service to the Profession

- External peer-reviewer of four grant proposals and five journal articles (2001 – 2008)

Faculty Development Activities

- Attended the NITLE Moodle Users Workshop. Denver, Colorado (October 2007)
- Attended the PEW Midstates Science and Mathematics Consortium Workshop on Interdisciplinary Science Education. St. Olaf College (February 2007)
- Attended the PEW Nanotechnology Workshop. Lawrence University (March 2004)
- Attended the American Association of Physics Teachers Workshop for New Physics and Astronomy Faculty. Washington, DC (November 2003)

Major Curriculum Development

- Member of the Science Conversation development group. The "Sci-Con" is a proposed year-long integrated sequence of three courses, intended to explore the development of modern science and its interactions with philosophy, religion, and society. It is designed as a general education program for sophomores from across the college. I have participated actively in the meetings and work of the development group, which was formed in the Fall of 2006 and continues to the present.
- Proposed and acquired new teaching workstations (NI-ELVIS) and computers for the electronics course, Physics 246. This was a collaborative effort with Dr. Jason Engbrecht. The revised course includes analog, digital, and computer interfacing. (Spring 2008)
- Restructured the advanced lab Physics 385 to provide more scheduled time per experiment and to require formal reports. Added two new experiments: Modern Interferometry and Magnetic Force and Torque. (Spring 07-08)
- Completely revised Analytical Physics III (Physics 228) by introducing a new textbook, *Matter and Interactions* by Chabay and Sherwood, and new experiments. This text uses ideas from recent physics education research to update the introductory physics curriculum. The coursework involves context-rich problems, computer simulation exercises and projects, and hands-on experiments on fundamental concepts in electricity and magnetism, as well as exams and quizzes. (Fall 2005)
- At Grinnell College, created and taught a first-year tutorial using great books in Western intellectual history to teach college-level reading, discussion, and writing. Also developed a discussion-based special topics course on contemporary ideas in physics. This course discussed developments in physics from the point of view of Thomas Kuhn's *Structure of Scientific Revolutions*. (2001 – 2003)

Professional Memberships

- American Physical Society
- American Association of Physics Teachers
- Council on Undergraduate Research
- AVS – The Science and Technology Society

Academic Honors

- Fellow, Graduate School**,** University of Minnesota, 1994-95
- Phi Kappa Phi, elected 1995
- Phi Beta Kappa, elected 1993

IV. COLLEGE ACTIVITIES (St. Olaf College only)

College Committees

- Member of Faculty Development / Faculty Life Committee (Fall 2007 – present)
- Science Building Dedication Committee (Interim 2008 – present)
- Phi Beta Kappa, Vice president (2007-2008), members-in-course committee (2006-2007)
- IDOCS committee member (Spring 2007)
- CEPC special courses subcommittee member (2005-2007)
- Fulbright Faculty Committee member (Fall 2006)

Service to the college community

- Philosophy faculty search committee (Spring 2008 and Fall 2008)
- Center for Innovation in the Liberal Arts (CILA) Learning Community participant: The Uses and Effectiveness of Personal Response Systems (2008-2009)
- Buntrock Scholars interviewer (Spring 2006, 2007)
- Week One discussion leader for "First Class" of incoming first-year students (Fall 2006)
- Faculty Panel member for admissions recruiting events (Five times during 2005-2008)

Physics department duties and activities

- Departmental colloquium series organizer (Spring 2007, 2008)
- Revised the lab manuals for Physics 228 and Physics 125, and advised students hired to assist with this project (Summer 2007)
- New science building. Helped design spaces, furniture, and details of several rooms of the building in a series of meetings and email discussions. (Fall 2005 – Spring 2008)

On-campus presentations

- CILA lunch presenter: *The Conversation Programs at St. Olaf*: Science Conversation (Spring 2008), *Teaching with Technology Poster Session* (Fall 2007), *Using Visuals and Film in the Classroom* (Fall 2007)
- *Micro/Nano Friction at St. Olaf College: Recent Results, Reaching Out.* A colloquium presentation to the St. Olaf College Physics Department (December 2007)
- *Studying Friction at the Atomic Level.* A colloquium presentation to the St. Olaf College Physics Department (October 2005)
- *Good Vibrations: Using Oscillatory Motion to Study the Fundamentals of Friction.* A colloquium presentation to the St. Olaf College Physics Department (November 2004)

V. COMMUNITY SERVICE

- Numerous public performances as a brass musician and soloist with local music organizations, especially the Sheldon Theater Brass Band (1995 – 1998, 2005 – present) and Ameriikan Poijat, a Finnish-American brass septet (1991 – present)
- Hurricane Katrina clean-up volunteer during Spring Break week in 2007