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Personal and professional vita

Professional Appointments

Nov. 2001-present	Member of Graduate Faculty, Dept. of Chem. Eng. & Mat. Sci., University of Minnesota
July 2000 – present	Director, Characterization Facility, Institute of Technology, University of Minnesota
Sept. 1998 – present	Senior Research Associate, Characterization Facility (formerly CIE), University of Minnesota
Sept. 1994 – Sept. 1998	Research Associate, Center for Interfacial Engineering (CIE), University of Minnesota
Nov. 1991 – Sept. 1994	Postdoctoral Fellow, Department of Chemistry and Center for Interfacial Engineering, University of Minnesota (with Wayne Gladfelter and DuPont Medical Products)

Education

Ph. D. 1991	University of Minnesota (Physics; thesis advisor – Alfonso Franciosi)
B. A. 1985	Gustavus Adolphus College (Physics)

Professional Membership

American Chemical Society
Materials Research Society
Society of Rheology
American Physical Society

Peer-Reviewed Journal Publications

1. A. Raisanen, D. J. Peterman, A. Wall, S. Chang, G. Haugstad, X. Yu and A. Franciosi, “Yb diffusion barriers at $\text{Hg}_{1-x}\text{Cd}_x\text{Te}$ interfaces with Al, In and Cr”, *Solid State Commun.* **71**, 585 (1989).
2. A. Franciosi, A. Raisanen, G. Haugstad, G. Ceccone, X. Yu and A. Franciosi, “Probing island growth and coalescence at metal-semiconductor interfaces”, *Phys. Rev. B* **41**, 7914 (1990).
3. A. Raisanen, G. Haugstad, X. Yu, G. Ceccone and X. Yu, “An anomalous diffusion barrier case: The $\text{Hg}_{1-x}\text{Cd}_x\text{Te}/\text{Yb}/\text{Ag}$ junction”, *J. Vac. Sci. Technol. A* **6**, 3265 (1990).
4. X. Yu, A. Raisanen, G. Haugstad, G. Ceccone, N. Troullier and A. Franciosi, “Low temperature photoemission measurements of valence band discontinuities at buried heterojunctions”, *Phys. Rev. B* **42**, 1872 (1990).
5. G. Haugstad, A. Raisanen, L. Sorba, L. Vanzetti, X. Yu and A. Franciosi, “A new probe of metallization microstructure on semiconductor surfaces”, *J. Vac. Sci. Technol. B* **9**, 2415 (1991).
6. A. Wall, A. Raisanen, G. Haugstad, L. Vanzetti and A. Franciosi, “Interdiffusion at the Mn-CdTe(110) interface and the formation of metastable ternary semimagnetic semiconductor alloys”, *Phys. Rev. B* **44**, 8185 (1991).

7. G. Haugstad, C. Caprile and A. Franciosi, "A photoemission study of cluster growth and morphology on inert substrates", *J. Appl. Phys.* **70**, 7333 (1991).
8. A. Raisanen, G. Haugstad, X. Yu and A. Franciosi, "Reaction and growth of Yb/Hg_{1-x}Cd_xTe interfaces", *J. Appl. Phys.* **70**, 3115 (1991).
9. A. Raisanen, G. Haugstad, X. Yu and A. Franciosi, "Gd and Sm interfaces with Hg_{1-x}Cd_xTe(110) and a general model of rare earth/Hg_{1-x}Cd_xTe(110) interface formation", *J. Appl. Phys.* **72**, 1104 (1992).
10. G. Haugstad, A. Raisanen, X. Yu, L. Vanzetti and A. Franciosi, "A photoemission study of adsorbed Xe on GaAs(110), HgTe(110) and Hg_{1-x}Cd_xTe(110) surfaces", *Phys. Rev. B* **46**, 4102 (1992).
11. L. Vanzetti, X. Yu, A. Raisanen, L. Sorba, G. Haugstad, G. Bratina and A. Franciosi, "Engineering ZnSe–GaAs band offsets", *J. Cryst. Growth* **117**, 573 (1992).
12. X. Yu, L. Vanzetti, G. Haugstad, A. Raisanen and A. Franciosi, "Inequivalent sites for Hg at the HgTe(110) Surface", *Surf. Sci.* **275**, 92 (1992).
13. X. Yu, A. Raisanen, G. Haugstad, N. Troullier, G. Biasiol and A. Franciosi, "Nonmagnetic-semimagnetic semiconductor heterojunctions: Ge–CdMnTe(110)", *Phys. Rev. B* **48**, 4545 (1993).
14. **Cover feature:** G. Haugstad, W. L. Gladfelter, M. P. Keyes and E. B. Weberg, "Atomic force microscopy of AgBr crystals and adsorbed gelatin films", *Langmuir* **9**, 1594 (1993).
15. G. Haugstad, W. L. Gladfelter and E. Weberg, "Friction force microscopy of AgBr crystals: Ag⁰ rods and adsorbed gelatin films", *Langmuir* **9**, 3717 (1993).
16. G. Haugstad and W. L. Gladfelter, "Force-displacement measurements in a beam-reflection scanning force microscope: calibration issues", *Ultramicroscopy* **54**, 31 (1994).
17. G. Haugstad, W. L. Gladfelter, E. B. Weberg, R. T. Weberg and T. D. Weatherill, "Probing biopolymers with scanning force methods: Adsorption, Structure, Properties and Transformation of Gelatin on Mica", *Langmuir* **10**, 4295 (1994).
18. G. Haugstad, W. L. Gladfelter, E. B. Weberg, R. T. Weberg, T. D. Weatherill and R. R. Jones, "Scanning force microscopy of gelatin films in the dry, swollen and redried states", *Mat. Sci. Eng. C* **3**, 85(1995).
19. G. Haugstad, W. L. Gladfelter, E. B. Weberg, R. T. Weberg and R. R. Jones, "Probing molecular relaxation on polymer surfaces with friction force microscopy", *Langmuir* **11**, 3473 (1995).
20. G. Haugstad, W. L. Gladfelter, E. B. Weberg, R. T. Weberg and R. R. Jones, "Friction force microscopy as a probe of molecular relaxation on polymer surfaces", *Trib. Lett.* **1** 253 (1995).
21. **Invited review:** G. Haugstad, "Scanning force microscopy investigations of biopolymers", *Trends Polym. Sci.* **3**, 353 (1995).
22. G. Haugstad, W. L. Gladfelter and R. R. Jones, "Nanotribology on a polymer network film", *J. Vac. Sci. Technol. A* **14**, 1864 (1996).
23. J. A. Hammerschmidt, B. Moasser, W. L. Gladfelter, G. Haugstad and R. R. Jones, "Polymer viscoelastic properties measured by friction force microscopy", *Macromolecules* **29**, 8996 (1996).
24. D. C. Gilmer, D. G. Colombo, C. J. Taylor, J. Roberts, G. Haugstad, S. A. Campbell, H. -S. Kim, G. D. Wilk, M. A. Gribelyuk and W. L. Gladfelter, "Low temperature chemical vapor deposition of crystalline titanium dioxide films using tetranitratotitanium (IV)", *Chem. Vap. Deposition* **4**, 9 (1998).
25. N. R. M. Crawford, J. S. Knutsen, K. -A. Yang, G. Haugstad, S. McKernan, F. B. McCormick and W. L. Gladfelter, "Splitting the coordinated nitric oxide in Co(CO)₃(NO) leads to a nanocrystalline, conductive oxonitride of cobalt", *Chem. Vap. Deposition* **4**, 181 (1998).
26. G. Haugstad, W. L. Gladfelter and R. R. Jones, "Scanning force microscopy characterization of viscoelastic deformations induced by precontact attraction in a low crosslink density gelatin film", *Langmuir* **14**, 3944 (1998).

27. R. H. Schmidt, G. Haugstad and W. L. Gladfelter, "Correlation of nanowear patterns to viscoelastic response in a thin polystyrene melt", *Langmuir* **15**, 317 (1999).
28. **Cover feature:** G. Haugstad and R. R. Jones, "Mechanisms of dynamic force microscopy on polyvinyl alcohol: Region-specific non-contact and intermittent contact regimes ", *Ultramicroscopy* **76**, 77 (1999).
29. J. A. Hammerschmidt, W. L. Gladfelter, G. Haugstad, "Probing polymer viscoelastic relaxations with temperature controlled friction force microscopy", *Macromolecules* **32**, 3360 (1999).
30. G. Haugstad, R. R. Jones and W. L. Gladfelter, "Tip-sample interactions in dynamic force microscopy of polyvinyl alcohol films", *Polymer International* **49**, 427 (2000).
31. R. H. Schmidt, G. Haugstad and W. L. Gladfelter, "Scan-induced patterning in glassy polymer films: using scanning force microscopy to study plastic deformation at the nanometer length scale", *Langmuir* **19**, 898 (2003).
32. R. H. Schmidt, G. Haugstad, and W. L. Gladfelter, "Scan-induced patterning and the glass transition in polymer films: temperature and rate dependence of plastic deformation at the nanometer scale", *Langmuir* **19**, 10390 (2003).
33. G. Haugstad, "Contrasting static-to-kinetic friction transitions on layers of an autophobically dewetted polymer film using Fourier-analyzed shear modulation force microscopy", *Trib. Lett.* **19**, 49 (2005).
34. K. Puntambekar, J. Dong, G. Haugstad and C. D. Frisbie, "Structural and electrostatic complexity at a pentacene/insulator interface", *Adv. Funct. Mater.* **16**, 879 (2006).
35. F. Ahimou, M. J. Semmens, P. J. Novak, G. Haugstad, "Biofilm cohesiveness measurement using a novel AFM methodology", *Applied and Environmental Microbiology*, submitted.
36. F. Ahimou, M. J. Semmens, G. Haugstad, P. J. Novak, "Effect of protein, polysaccharide, and oxygen concentration profiles on biofilm cohesiveness", *Applied and Environmental Microbiology*, submitted.

Peer-Reviewed Contributions to Edited Volumes and Conference Proceedings

37. G. Haugstad, A. Raisanen, C. Caprile, X. Yu and A. Franciosi, "Photoemission characterization of thin film nucleation on inert substrates", *Mat. Res. Soc. Symp. Proc.* **159**, 51 (1990).
38. A. Raisanen, G. Haugstad, X. Yu, G. Ceccone and A. Franciosi, "Enhanced metallization stability on mercury-cadmium telluride", *Mat. Res. Soc. Symp. Proc.* **161**, 297 (1990).
39. A. Wall, A. Raisanen, G. Haugstad and A. Franciosi, "Room-temperature diffusion of Mn in CdTe and the formation of $Cd_{1-x}Mn_xTe$ ", *Mat. Res. Soc. Symp. Proc.* **163**, 665 (1990).
40. X. Yu, N. Troullier, A. Raisanen, G. Haugstad and A. Franciosi, "In-situ studies of semimagnetic heterojunction parameters", *Mat. Res. Soc. Symp. Proc.* **161**, 459 (1990).
41. X. Yu, A. Raisanen, G. Haugstad, G. Ceccone, G. Bratina, L. Sorba and A. Franciosi, "In-situ studies of CdTe-GaAs(110) heterojunction parameters by low temperature photoemission", *Proc. 20th Int. Conf. on the Physics of Semiconductors* (World Scientific, Singapore, 1991), p. 191.
42. G. Haugstad, W. L. Gladfelter, E. B. Weberg, R. T. Weberg and T. D. Weatherill, "Scanning force characterization of biopolymer films: gelatin on mica", *Proc. of the 1994 AFM/STM symposium at U.S. Army Natick R, D & E Center*.
43. G. Haugstad, W. L. Gladfelter, E. B. Weberg, R. T. Weberg and T. D. Weatherill, "Probing biopolymer films with scanning force methods", *Mat. Res. Soc. Symp. Proc.* **355**, 253 (1995).
44. J. A. Hammerschmidt, G. Haugstad, B. Moasser, R. R. Jones and W. L. Gladfelter, "Correlating polymer viscoelastic properties with friction measures by scanning probe microscopy", in: *Scanning Probe Microscopy of Polymers*, eds. B. D. Ratner and V. V. Tsukruk, ACS Symposium Series, **694**, 288 (1998).

45. G. Haugstad, J. A. Hammerschmidt and W. L. Gladfelter, "Imaging mechanisms in dynamic force microscopy of polymers", *Proceedings: Microscopy and Microanalysis*, **5**, 990 (1999).
46. R. H. Schmidt, W. L. Gladfelter and G. Haugstad, "Viscoelastic measurements in thin polystyrene melts as derived from scanning force microscopy-induced nanoflow patterns", in: *Microstructure and Microtribology of Polymer Surfaces*, eds. V. V. Tsukruk and K. J. Wahl, ACS Symposium Series, **741**, 227 (2000).
47. J. A. Hammerschmidt, G. Haugstad and W. L. Gladfelter, "Molecular relaxations in polymer films studied by temperature-controlled friction force microscopy", in: *Microstructure and Microtribology of Polymer Surfaces*, eds. V. V. Tsukruk and K. J. Wahl, ACS Symposium Series, **741**, 284 (2000).
48. G. Haugstad, J. A. Hammerschmidt and W. L. Gladfelter, "Viscoelasticity in nanoscale friction on thin polymer films", in: *Interfacial Properties on the Submicron Scale*, eds. J. Frommer and R. M. Overney, Oxford University Press, p. 230 (2001).

Other Publications

49. G. Haugstad, W. L. Gladfelter, E. B. Weberg, R. T. Weberg and T. Weatherill, "Lateral force microscopy of gelatin film structure and properties", *CIE Interface* (newsletter of the Center for Interfacial Engineering) **7**, 7 (1994).
50. G. Haugstad, "Ion Beam Analysis", *CIE Interface* (newsletter of the Center for Interfacial Engineering) **8**, 13 (1995).
51. J. A. Hammerschmidt, R. Schmidt and G. Haugstad, "Polymer and coating technology", *Molecular Imaging Application Note* (1997).
52. G. Haugstad, J. A. Hammerschmidt, W. L. Gladfelter, "Probing polymer surface properties with multiple imaging modes", *Molecular Imaging Application Note* (1998).
53. G. Haugstad, J. A. Hammerschmidt, W. L. Gladfelter, "Non-contact and intermittent-contact scanning force microscopy of polyvinyl alcohol films", *ACS Polymer Preprints* **39**, 1189 (1998).
54. G. Haugstad, "Imaging mechanisms in dynamic force microscopy", *CIE Characterization Facility Application Note* (1998).
55. Invited: G. Haugstad, "Imaging mechanisms in dynamic force microscopy of polymers", *Microscopy Today* (June 1999).
56. G. Haugstad, "A study of comparative energy dissipation during sliding, pull-Off, and intermittent repulsion- or attraction-dominant interactions", *Extended Abstract: 2nd International Conference on SPM of Polymers* (2001).
57. G. Haugstad, "Probing Swelling and Molecular Conformation on Polymeric Coatings for Biocompatibility", *ACS Polymer Preprints* **44** (1) (2003).
58. G. Haugstad, C. Dykstra and W. L. Gladfelter, "Shear modulation microscopy as an ultra-sensitive probe of nonlinear response: stick-to-slide transitions and viscoplastic deformations of polymers", *ACS Polymer Preprints* **44** (1) (2003).
59. G. Haugstad, "Probing mesoscale molecular domains at surfaces of polymeric condensed matter with scanning force microscopy", *ACS Polymer Preprints* **45** (1) (2004).
60. G. Haugstad, "Nonlinear Response in Nanoshear Modulation Force Microscopy: Fourier Analysis", *NSTI Nanotechnology Conference Proceedings* (May 2005).
61. G. Haugstad and A. Avery, "Probing the morphology and tribo-response of nanostructured fluid films for personal care applications", *NSTI Nanotechnology Conference Proceedings* (May 2005).
62. J. Dong and G. Haugstad, "Tribology study of PVA contact lens in ionic aqueous environments", *ACS Polymer Preprints*, Aug 2005.

International Conference Presentations (presenting author)

<u>Event</u>	<u>Location</u>	<u>Dates</u>	<u>Title</u>
1. National Meeting of the Materials Research Society	Boston, MA	Nov 1989	“Photoemission Characterization of Thin Film Nucleation on Inert Substrates”
2. Annual Conference on the Physics and Chemistry of Semiconductor Interfaces	Long Beach, CA	Jan 29 - Feb 1, 1991	“A New Probe of Metallization Microstructure on Semiconductor Surfaces”
3. National Meeting of the American Physical Society	Cincinnati, OH	March 1991	“Measurement of Local Work Function in Metal-Semiconductor Interfaces”
4. Annual Conference of the Society for Imaging Science and Technology	Cambridge, MA	May 9-14, 1993	“Atomic Force Microscopy of the AgBr(111) Surface and Adsorbed Gelatin Films”
5. Second AFM/STM symposium at U.S. Army Natick R,D&E Center	Natick, MA	June 7-9, 1994	“Probing Biopolymers with Scanning Force Methods: Adsorption, Structure, Properties and Transformation of Gelatin on Mica”
6. National Meeting of the Materials Research Society	Boston, MA	Nov 28-Dec 2 1994	“Scanning Force Microscopy of Gelatin Films in the Dry, Swollen and Redried States”
7. National Meeting of the Materials Research Society	Boston, MA	Nov 28-Dec 2 1994	“Probing Biopolymer Films with Scanning Force Methods”
8. National Meeting of the American Chemical Society	Anaheim, CA	April 2-6, 1995	“Probing Molecular Relaxation on Polymer Surfaces with Friction Force Microscopy”
9. National Symposium of the American Vacuum Society	Minneapolis, MN	Oct. 16-20, 1995	“Nanotribology on a Polymer Network Film”
10. National Meeting of the Materials Research Society (invited)	Boston, MA	Dec. 2-6 1996	“Inducing and Probing Nanoscale Delamination with a Scanning Force Microscope”
11. National Meeting of the American Physical Society	Los Angeles, CA	March 16-20, 1998	“Viscoelastic Dissipation in the Nanotribology of Thin Polymer Films”
12. World Polymer Congress of the International Union of Pure and Applied Chemistry	Gold Coast Australia	July 12-17 1998	“Viscoelastic Dissipation in the Nanotribology of Thin Polymer Films”
13. National Meeting of the American Chemical Society	Boston, MA	Aug. 23-27 1998	“Non-contact and Intermittent-Contact Scanning Force Microscopy of Polyvinyl Alcohol Films”
14. 3 rd International Conference on the Development and Technological Application of Scanning Probe Methods (SXM3)	Basel Switzerland	Sept. 14-17, 1998	“Dynamic Force Microscopy of Polyvinyl Alcohol Films: Intermittent Solid vs. Fluid Contact”
15. National Meeting of the Microscopy Society of America	Portland, OR	Aug. 1-5, 1999	“Imaging Mechanisms in Dynamic Force Microscopy of Polymers”
16. National Meeting of the American Chemical Society (invited)	New Orleans, LA	Aug. 22-26, 1999	“Energy Dissipation and Surface Fluidity in Dynamic Force Microscopy”
17. National Meeting of	New Orleans, LA	Aug. 22-26, 1999	“Nanotribology of Polymer Thin Films”

the American Chemical Society (workshop: Molecular Imaging)			Under Controlled Temperature and Humidity”
18. National Meeting of the American Association of Pharmaceutical Scientists (workshop: Molecular Imaging)	New Orleans, LA	Nov. 15-17, 1999	“Nanoscale Probing of Gelatin Films Under Controlled Environment with Scanning Force Microscopy”
19. National Meeting of the American Physical Society	Minneapolis, MN	March 20-24, 2000	“Energy Dissipation in Dynamic Modes of Scanning Force Microscopy”
20. National Meeting of the North American Membrane Society	Boulder, CO	May 23-27, 2000	“Property-Sensitive Imaging of Ultrafiltration Membranes Using Dynamic (Tapping Mode) Force Microscopy”
21. National Meeting of the Microscopy Society of America	Philadelphia, PA	Aug. 12-17, 2000	“Contrasting Organic Materials Via Nanoscale Energy Dissipation in Scanning Force Microscopy”
22. Pacifichem (invited) (Pacific-rim Chemical Societies)	Honolulu, HA	Dec. 14-19, 2000	“Energy Dissipation Contrast on Thin Polymer Films with Scanning Force Microscopy”
23. 2 nd International Conference on Scanning Probe Microscopy of Polymers (invited)	Weingarten Germany	July 21-25, 2001	“A Study of Comparative Energy Dissipation During Sliding, Pull-Off and Dynamic Interaction”
24. National Symposium of the American Vacuum Society	San Francisco, CA	Oct. 30, 2001	“Nanowear Patterning as an Activated Craze Process”
25. National Symposium of the American Vacuum Society	San Francisco, CA	Oct. 30, 2001	“Single-Asperity Nanotribology and Nanorheology of Thin Poly(dimethylsiloxane) Films”
26. National Symposium of the American Vacuum Society	San Francisco, CA	Oct. 31, 2001	“Comparative Energy Dissipation with Shear- and Normal- Force Scanning Probes”
27. National Meeting of the Materials Research Society	Boston, MA	Nov. 27, 2001	“Single-Asperity Nanotribology and Nanorheology of Thin Poly(dimethylsiloxane) Films”
28. National Meeting of the Materials Research Society	Boston, MA	Nov. 27, 2001	“Nanoshear Modulation as a Probe of Polymer Surfaces and Interfaces”
29. National Meeting of the Materials Research Society	Boston, MA	Nov. 28, 2001	“Nanowear Patterning as an Activated Craze Process”
30. National Meeting of the American Chemical Society	Boston, MA	Aug. 18, 2002	“Quantifying Film Thickness and Molecular Conformation on Swollen Polymer Films for Biocompatibility”
31. National Meeting of the American Chemical Society	Boston, MA	Aug. 19, 2002	“Fourier Analysis in Nanoshear Modulation of Polymers”
32. National Meeting of the American Chemical Society	Boston, MA	Aug. 19, 2002	“Approach-Retract Cycles with an Oscillating Nanotip: Powerful Methods to Interrogate Subsurface Morphology and Viscoelasticity on Polymers”
33. National Meeting of the Society of Rheology	Minneapolis, MN	Oct. 16, 2002	“AFM-Based Methodologies for Interfacial Nanorheology and Nanotribology”
34. National Meeting of the the American Chemical Society	New Orleans, LA	Mar. 25, 2003	“Shear Modulation Microscopy as an Ultra-sensitive Probe of Nonlinear Response: Stick-to-Slide Transitions and Viscoplastic Deformations of Polymers”
35. National Meeting of the American Chemical Society	New Orleans, LA	Mar. 26, 2003	“Probing Swelling and Molecular Conformation on the Polymeric Coatings for Biocompatibility”

36. National Meeting of the American Chemical Society	Anaheim, CA	Mar. 29, 2004	“Confinement effects and the activation of molecular motion in polymer thin films at a moving nanoprobe”
37. National Meeting of the American Chemical Society	Anaheim, CA	Mar. 29, 2004	“Probing mesoscale molecular domains at surfaces of polymeric condensed matter with scanning force microscopy”
38. Workshop on Advanced Dynamic AFM Methods	Tres Cantos, Spain	Oct. 10, 2004	“Approach-retract cycles with an oscillating nanotip: Imaging and probing response on complex ultrathin organic films”
39. Seeing at the Nanoscale II International Conference	Grenoble, France	Oct. 13-15, 2004	“Nonlinear Response in Shear Modulation Force Microscopy: Fourier Analysis”
40. National Meeting of the Materials Research Society	Boston, MA	Dec. 1, 2004	“Kinetic Studies of Molecular Motion via Nanoshear: Issues of Surface, Bulk and Perturbation”
41. National Meeting of the Materials Research Society	Boston, MA	Dec. 3, 2004	“Fourier-Analyzed Shear Modulation Microscopy as a Probe of Molecular Mobility in Ultrathin Polymer Layers”
42. NSTI Nanotechnology Conference	Anaheim, CA	May 9, 2005	“Nonlinear Response in Nanoshear Modulation Force Microscopy: Fourier Analysis”
43. NSTI Nanotechnology Conference	Anaheim, CA	May 11, 2005	“Probing the morphology and tribo-response of nanostructured fluid films for personal care applications”
44. National Meeting of the Materials Research Society	Boston, MA	Nov. 30, 2005	“Probing structure and disorder with “two-axis” LFM: crystalline pentacene films for organic electronics”
45. Pacificchem (Pacific-rim Chemical Societies)	Honolulu, HA	Dec. 15, 2005	“Imaging force versus distance and manipulating nanostructures on biological and biocompatible polymer films”
46. Pacificchem (Pacific-rim Chemical Societies)	Honolulu, HA	Dec. 17, 2005	“Kinetic studies of molecular motion via AFM-based nanoshear: issues of surface and perturbation”
47. Pacificchem (Pacific-rim Chemical Societies)	Honolulu, HA	Dec. 18, 2005	“Characterizing the hierarchical structure of complex polymeric films: new procedures in resonant and nonresonant dynamic atomic force microscopy”
48. National Meeting of the Society for Biomaterials (invited)	Pittsburgh, PA	April 26, 2006	“Nanoscale Imaging and Characterization of Biological and Biomedical Polymers: Force Microscopy Methods”

Invited External Seminars

<u>Institution / Event</u>	<u>Location</u>	<u>Dates</u>	<u>Title</u>
DuPont Medical Products	Brevard, NC	Oct. 6, 1992	“Atomic Force Microscopy of AgBr Surfaces and Adsorbed Species”
Gustavus Adolphus College	St. Peter, MN	April 1994	“Probing the Structure and Properties of Materials Locally: Scanning Force Methods”
DuPont Medical Products	Brevard, NC	April 1994	“Gelatin Film Characterization via Scanning Force Methods
DuPont Medical Products	Brevard, NC	Dec. 1994	“Probing the Nanoscale Structure and Properties of

			Gelatin Films with Friction Force Microscopy”
DuPont Experimental Station	Wilmington, DE	Dec. 1994	“Probing the Nanoscale Structure and Properties of Polymer Surfaces with Friction Force Microscopy”
Sterling Diagnostic Imaging	Brevard, NC	Aug. 1996	“Practical Characterization of Gelatin Films with Friction Force Microscopy: Role of Processing Parameters and Additives”
Sterling Diagnostic Imaging	Brevard, NC	Aug. 1996	“Frontiers of Scanning Probe Microscopy as a Local Probe of the Structure and Properties of Polymers”
Eastman Kodak Company	Rochester, NY	Oct. 29, 1996	“A New Tool for Probing Polymeric Networks: Scanning Force Microscopy of Gelatin Films”
Molecular Imaging Corporation	Phoenix, AZ	Sept. 1997	“Probing Polymer Surface Properties with Scanning Force Microscopy”
Toyo Corporation /Molecular Imaging seminars & demonstrations	Tokyo, Japan Osaka, Japan	June 1-2, 1998 June 4, 1998	“Probing Viscoelasticity on Polymer Films with Scanning Force Microscopy”
Exxon Chemical Corporation	Baytown, TX	Aug. 11, 1998	“Scanning Force Microscopy of Polymers: Friction, Stiffness, Damping and Wear Under Variable Temperature and Rate”
SUNY Stony Brook / BNL Garcia MRSEC University/Industry Workshop on Nanoscale Structure and Imaging in Polymers	Brookhaven Lab Long Island, NY	Oct. 25-27, 1998	“Nanoscale Surface Dissipation in Dynamic Force Microscopy of Polyvinyl Alcohol Films”
Minnesota Microscopy Society Annual Meeting	St. Paul, MN	May 13, 1999	“Dynamic Force Microscopy as a Probe of the Structure and Properties of Polymeric Materials”
Columbia University Workshop Industry/University Center for Novel Surfactants	New York, NY	Oct. 24, 2000	“Nanoscale Characterization of Organic Materials”
Medtronic Company	Fridley, MN	Dec. 5, 2000	“Scanning Probe Microscopy and Ion Beam Analysis Thin Film Systems”
Unilever Corporation	Port Sunlight, England	Feb. 28, 2001	“Investigating the Tribological Properties of Polymer Films with Scanning Probe Microscopy”
Unilever Corporation	Port Sunlight, England	Mar. 2, 2001	“Interfacial and Materials Research at the University of Minnesota’s IT Characterization Facility and IPRIME Research Center”
Molecular Imaging Corporation	Phoenix, AZ	June 8, 2001	“Scanning Probe Microscopy of Polymers: Capabilities, Limitations and Frontiers”
H.B. Fuller Corporation	St. Paul, MN	October 15, 2001	“Polymer Research Opportunities at the University of Minnesota’s IT Characterization Facility”
MRSEC Directors Meeting	Providence, RI	November 30, 2001	“University-Based Materials Characterization: A Facility for Academia, Industry and Government”
Hysitron Incorporated	Minneapolis, MN	January 11, 2002	“Nanotribology of Polymers with Scanning Force Microscopy”

Schlumberger	Sugarland, TX	April 17, 2002	“Scanning Force Microscopy and Ion Beam Analysis of Thin Films and Interfaces”
Unilever Corporation	Port Sunlight, England	April 29, 2002	“Structure and Nanotribological Properties of Model Shampoo and Conditioners”
Ecolab, Inc.	Mendota Heights, MN	October 8, 2002	“The University of Minnesota’s IT Characterization Facility: Soft Materials and Interfacial Analysis”
Rohm & Haas, Inc.	Spring House, PA	November 7, 2002	“AFM-Based Methodologies for Interfacial Nanorheology and Nanotribology”
Boston Scientific	Maple Grove, MN	April 1, 2003	“The University of Minnesota’s IT Characterization Facility: Soft Materials and Interfacial Analysis
University of Washington Dept. of Chem. Engineering	Seattle, WA	May 19, 2003	“Nanoscale structure and dynamics on polymeric surfaces: Measurement, manipulation and visualization via scanning probe microscopy”
Boston Scientific	Maple Grove, MN	Oct. 29, 2003	“Atomic Force Microscopy (AFM): Basic principles and an overview of techniques”
Boston Scientific	Maple Grove, MN	Oct. 29, 2003	“Practical considerations and important parameters in AFM measurements on soft materials and in different environments”
University of Ulm Dept. of Physics domains”	Ulm, Germany	Oct. 12, 2004	“Polymer surface & thin-film tribology in 6D: examining temperature, time and load over nanoscale spatial
Ciba Vision (Novartis)	Atlanta, GA	Nov. 10, 2004	“Nanoscale structure and dynamics on polymeric surfaces: Visualization, measurement and manipulation via scanning probe microscopy”
Molecular Imaging Corporation	Phoenix, AZ	Aug. 17, 2005	“Fundamental underpinnings of AC mode and lateral force mode: material contrast via phase and friction
Max Planck Institute for Polymer Research	Mainz, Germany	Jan. 31, 2006	“Nonlinear response in shear modulation force microscopy: Fourier analysis”
WITec GmbH	Ulm, Germany	Feb. 1, 2006	“Digital pulsed force mode: Imaging complex polymeric coatings and probing viscoelastic properties”

Local Institution Presentations (presenting author)

<u>Event</u>	<u>Location</u>	<u>Dates</u>	<u>Title</u>
Condensed Matter Physics Group, sack-lunch seminars	University of Minnesota	1987-1990	[Four presentations on graduate research]
CIE Fall Meetings and Thin Film Group meetings (Oral and Poster Sessions)	University of Minnesota	1989-1991	[Four presentations on graduate research]
Meeting of the Minnesota Chapter of the American Vacuum Society	University of Minnesota	1991	“Measurement of Local Work Function in Metal-Semiconductor Interfaces”
Ph. D. Thesis Defense Public Seminar	University of Minnesota	Feb 1992	“Photoemission from Physisorbed Xenon as a Probe of Metal-Semiconductor Interfaces”

CIE Spring Meeting: Workshop on Academic- Industrial Collaboration	University of Minnesota	May 1992	“Atomic Force Microscopy of AgBr Structures”
CIE Fall Meeting Oral Session	University of Minnesota	Sept. 15-17, 1992	“AFM of AgBr Crystals and Adsorbed Gelatin Films”
CIE Fall Meeting Poster Session	University of Minnesota	Sept. 1993	“Probing the Structure and Properties of Water-Soluble Polymer Films Using Scanning Probe Microscopy”
CIE Fall Meeting Poster Session	University of Minnesota	Sept. 1993	“Force-Displacement Measurements in a Beam-Reflection Scanning Force Microscope: Calibration Issues”
CIE Thin Film Group Seminar	University of Minnesota	Feb. 1994	“Distinguishing Materials via Frictional Forces in Scanning Force Microscopy”
CIE SPM Users Meeting Seminar	University of Minnesota	Feb. 1994	“Normal and Lateral Force Calibration in Scanning Force Microscopy
CIE Fall Meeting Oral Session	University of Minnesota	Sept. 20-22 1994	“Molecular Relaxation and Manipulation in Biopolymer Films: Scanning Force Methods”
CIE Spring Meeting: Workshop on Polymer Surface Characterization	University of Minnesota	May 1995	“Relaxation Processes in Gelatin Films Measured by Friction Force Microscopy“
CIE Characterization Facility Master Class in in Ion Beam Analysis	University of Minnesota	Sept. 18, 1995	“Light Element Analysis in Materials Using Nuclear Reaction Analysis”
Materials Chemistry Group Seminar (Chemistry dept.)	University of Minnesota	Mar. 1996	“Friction Force Microscopy of Polymers”
CIE Spring Meeting: Workshop on Applications of SPM	University of Minnesota	May 1996	“Friction Force Microscopy of Polymers”
CIE Fall Meeting Oral and Poster Sessions	University of Minnesota	Sept. 1996	“Inducing and Probing Nanoscale Delamination with a Scanning Force Microscope”
Nanoscience Group Seminar (ChemEng/MatSci)	University of Minnesota	Jan. 1997	“Probing the Local Viscoelasticity of Polymer-Network Films With Scanning Force Microscopy: a Gelatin Case Study”
CIE Spring Meeting: Workshop on Nanomechanical Testbed	University of Minnesota	May 1997	“Comparative Nanoscale Measurements of Elastic Moduli on Soft Materials with a Scanning Force Microscope”
NAIG seminar (Biochemistry/Chemistry)	University of Minnesota	Feb. 1998	“Stretching and Peeling Protein Strands with a Scanning Force Microscope”
CIE Characterization Facility Master Class in Scanning Probe Microscopy	University of Minnesota	May 22, 1998	“Probing Viscoelasticity on Polymer Films with Scanning Force Microscopy”
Polymer Group Seminar (ChemEng/MatSci)	University of Minnesota	Feb. 24, 1999	“Scanning Probe Microscopy and Ion Beam Analysis for Polymer Characterization”
CIE Annual Meeting Poster Session	University of Minnesota	May 10-12, 1999	“Imaging mechanisms in dynamic force microscopy of heterogeneous polymer films”

IPRIME Annual Meeting Scanning Probe Microscopy Workshop	University of Minnesota	May 18, 2000	“Attractive Interaction Studies on the Nanometer Scale with Dynamic Force Methods”
Department of Civil Eng. Seminar	University of Minnesota	Mar. 23, 2001	“Probing the Properties of Materials and Interfaces: Nanoscale Techniques”
IPRIME Annual Meeting Poster Session	University of Minnesota	May 15, 2001	“Probing Material Structure, Composition and Crystallinity:Electron Microscopy, Ion Beam Analysis, and X-ray Scattering”
IPRIME Annual Meeting Poster Session	University of Minnesota	May 15, 2001	“Proximal Probes of Surfaces and Interfaces: Metrology and Local Response of Materials”
Structural Biology Club (Biophys/Biochem etc.)	University of Minnesota	Jan. 28, 2002	“Micro- to Nano-Scale Physical Characterization of Biomaterials: Atomic Force Microscopy and Other Scanning Probe Methods”
Chem5210 Guest Lecture (Materials Characterization)	University of Minnesota	May 7, 2002	“A Survey of Nanoscale Characterization of Materials: ‘Atomic’ Force Microscopy and other Proximal Probes”
Meeting of the Minnesota Chapter of the American Vacuum Society	University of Minnesota	October 22, 2002	“Interfacial and Materials Research at the University of Minnesota’s IT Characterization Facility”
Structural Biology Club (Biophys/Biochem etc.)	University of Minnesota	Nov. 4, 2002	“AFM-Based Methodologies for Nanoscale Tribological and Rheological Characterization of Polymers”
Department of Pharmaceutics	University of Minnesota	Feb. 13, 2003	“Scanning Probe Methods for Nanoscale Characterization of Biomolecules and Bio-compatible Polymers”
IPRIME Annual Meeting Poster Session	University of Minnesota	May 28, 2003	“AFM-Based Methodologies for Interfacial Nanorheology and Nanotribology”
IPRIME Workshop: Release from Polymer Coatings and Particles	University of Minnesota	March 3, 2004	“Imaging and quantifying phase segregation on block copolymer coatings with dynamic force microscopy: “tapping mode AFM”
IPRIME Annual Meeting Nanostructured Materials and (SPM/AFM)” Processes Workshop	University of Minnesota	June 1, 2004	“Surface and thin film studies of polymers with scanning probe or ‘atomic force’ microscopy
IPRIME Annual Meeting Nanostructured Materials and Processes Program Review	University of Minnesota	June 2, 2004	“AFM imaging and rheology of polymeric surfaces: new understandings circa 2004”
IPRIME Annual Meeting Nanoprobe Master Class	University of Minnesota	June 3, 2004	“Shear Modulation Microscopy: Tribology and Surface Viscoelasticity on the Nanoscale”
IPRIME Annual Meeting Nanostructured Materials and Processes Program Review	University of Minnesota	June 2, 2005	“AFM Force Characterization over a 3D Domain on Polymeric Films: Digital Pulsed Force Mode”
Molecular Imaging Joint SPM Workshop	University of Minnesota	November 17, 2005	“Fundamentals of AC mode AFM and lateral force microscopy”
IPRIME Annual Meeting Nanostructured Materials and Processes Workshop	University of Minnesota	May 31, 2006	“Digital Pulsed Force Mode and Variable-Humidity AFM of Polymer/Drug Matrices

Service to Scientific Community

Peer Review: Publications (since 1992)

Langmuir
Macromolecules
Journal of Chemical Physics
Journal of Materials Science
Tribology Letters
Nanotechnology
Surface Science
The European Physical Journal E
Ultramicroscopy
Journal of Microscopy
Journal of Pharmaceutical Science
Trends in Polymer Science
Surface and Interface Analysis
Applied Surface Science
Thin Solid Films
Journal of Imaging Science and Technology
American Chemical Society Symposium Proceedings
Materials Research Society Symposium Proceedings
Cambridge University Press

Peer Review: Funding Agencies

National Science Foundation

Meeting Organizer:

<u>Event</u>	<u>Location</u>	<u>Dates</u>	<u>Symposium Title</u>
Center for Interfacial Engineering (Master Class: talks and lab)	University of Minnesota	Sept. 18, 1995	“Ion beam analysis Master Class”
Center for Interfacial Engineering (Master Class: talks and lab)	University of Minnesota	May 22-23, 1998	“Scanning probe microscopy Master Class”
IPRIME Annual Meeting (Workshop: talks)	University of Minnesota	May 18, 2000	“Scanning probe microscopy”
National Meeting of the Microscopy Society of America (Pre-meeting Congress)	Philadelphia, PA	Aug. 12-13, 2000	“SPM of Soft Materials”
IPRIME Annual Meeting (Master Class: talks and lab)	University of Minnesota	May 30-31, 2002	“Nanoprobe Master Class”
IPRIME Annual Meeting (Workshop: talks)	University of Minnesota	May 28, 2003	“Materials Characterization with Near-field Nanoprobes”
IPRIME Annual Meeting	University of	June 3-4, 2004	“Nanoprobe Master Class”

(Master Class: talks and lab)	Minnesota		
Molecular Imaging / UMinn. Joint Workshop	University of Minnesota	June 16, 2005	“Scanning Probe Microscopy Workshop”
Molecular Imaging / UMinn. Joint Workshop	University of Minnesota	Nov. 15-16, 2005	“Recent Advances in Scanning Probe Microscopy for Biomedical Applications”
NSTI Nanotech Conference (Annual international meeting)	Boston, MA	May 9-10, 2006	“Nanoscale Characterization”
IPRIME Annual Meeting (Workshop: talks)	University of Minnesota	May 31, 2006	“Nanocharacterization of Biomedical Polymer Coatings”
IPRIME Annual Meeting (Master Class: talks and lab)	University of Minnesota	June 1-2, 2006	“Nanomechanical Probes Master Class”
NSTI Nanotech Conference (Annual international meeting)	Santa Clara, CA	May 22-23, 2007	“Nanoscale Characterization”

Scientific panel member

NSF-funded shared experimental facilities	NSF, Washington, DC	Dec. 10, 2002
NSF Frontiers of Fundamental Tribological Research workshop	University of Houston	Oct. 6-8, 2004

Technical Administration and Oversight Committees

Research Infrastructure	University of Minnesota	1999
IT Characterization Facility (directorship)	University of Minnesota	2000-present
Materials Research Science and Engineering Center (MRSEC)	University of Minnesota	2000-present
Industrial Partnership for Research in Materials and Interfacial Engineering (I-Prime)	University of Minnesota	2000-present
Minnesota Nanotechnology Cluster (National Nanotechnology Infrastructure Network)	University of Minnesota	2004-present
Rushford Institute for Nanotechnology	Dakota County Technical Coll.	2005-present

Research Funding

<u>Granting Institution</u>	<u>Time Interval</u>	<u>Amount</u>
DuPont Medical Products (co-PI with W. L. Gladfelter)	Nov. 1994 – Nov. 1995	\$32,000
Petroleum Research Fund	Sept. 1995 – Sept. 1997	\$50,000

(co-PI with W. L. Gladfelter)		
DuPont Medical Products (co-PI with W. L. Gladfelter)	Nov. 1995 – Nov. 1996	\$38,000
Sterling Diagnostic Imaging (co-PI with W. L. Gladfelter)	Nov. 1996 – Nov. 1997	\$38,000
Molecular Imaging (PI)	calendar 1998	\$37,000
Molecular Imaging (PI)	calendar 1999	\$26,500
Unilever Research (PI)	Oct. 1999 – Oct. 2001	\$165,000
Molecular Imaging (PI)	calendar 2000	\$33,500
Molecular Imaging (PI)	calendar 2001	\$28,500
Unilever Research (PI)	Oct. 2001 – Dec. 2002	\$79,000
Unilever Research (PI)	Jan. 2003 – Aug. 2003	\$20,000
Ciba Vision Corporation, SPA (PI)	Mar. 2003 – Feb. 2004	\$75,000
NSF GOALI (Co-PI with M. Semmens and P. Novak)	Sept. 2003 – Aug. 2006	\$300,000
Boston Scientific, IPRIME (PI)	May 2004 – Apr. 2005	\$24,000
Surmodics, IPRIME (PI)	July 2004 – June 2005	\$12,000
Boston Scientific, IPRIME (PI)	May 2005 – Apr. 2006	\$13,000
Surmodics, IPRIME (PI)	July 2005 – June 2006	\$12,000
Surmodics, IPRIME (PI)	July 2006 – June 2007	\$12,000
Seagate, MINT (co-PI with W. Gladfelter)	Sept 2006 – Aug. 2007	\$60,000
Nanocopoeia, SPA subcontract of NSF SBIR (co-PI with R. Hoerr of Nanocopoeia)	Nov 2006 – Oct 2008	\$43,800
NSF DMR Solid-State Chemistry (co-PI with C. D. Frisbie)	pending	\$300,000

Active Research Collaborations

Research group

Project description

Dr. Jinping Dong, Characterization Facility, University of Minnesota	Environmental scanning probe microscopy (SPM) methods; nanoscience of soft materials
Prof. Wayne Gladfelter, Dept. of Chemistry, University of Minnesota Dr. Mehmet Hancer, Seagate	Environmental SPM of surface-modified diamond like carbon coatings in hard disk technology
Prof. C. Daniel Frisbie, Dept. of Chem. Eng. & Mat. Sci., Univ. of Minn.	Novel SPM imaging modes applied to crystalline organic semiconductors
Prof. Michael Semmens, University of Minnesota cohesive Prof. Paige Novak, University of Minnesota	Environmental SPM methods to measure biofilm strength
Dr. Klaus Wormuth, Surmodics	Environmental digital pulsed force mode AFM of drug-eluting biomedical coatings
Molecular Imaging Corporation, Phoenix, AZ	Development of SPM instrumentation and methodologies
WITec, Ulm, Germany	Digital pulsed force mode AFM and confocal Raman microscopy of polymeric materials

Research Advising

Jon Hammerschmidt	Ph.D student	Dept. of Chemistry (with Wayne Gladfelter)
Ron Schmidt	Ph.D student	Dept. of Chemistry (with Wayne Gladfelter)
Donna Staarup	Ph.D student	Dept. of Chemistry (with Wayne Gladfelter)
Srinivas Somayajula	Ph.D student	Dept. of Food Science (with Mike Semmens of Civil Eng.)
Kanan Puntambekar	Ph.D student	Dept. of Chemical Engineering and Materials Science (with Dan Frisbie)
Susheng Tan	Postdoctoral Associate	Dept. of Chemistry (with Wayne Gladfelter)
Jinping Dong	Postdoctoral Associate	Characterization Facility
Francois Ahimou	Postdoctoral Associate	Dept. of Civil Engineering (with Mike Semmens and Paige Novak)
Adam Swenson	Undergraduate	Dept. of Chemical Engineering and Materials Science
Josh Kube	Undergraduate	Dept. of Chemical Engineering and Materials Science

Teaching

<u>Institution</u>	<u>Dates</u>	<u>Item</u>
Dept. of Physics Gustavus Adolphus College	1983-1985	Academic assistant for 5 physics courses, freshman-junior level (recitation and grading)
Dept. of Physics University of Minnesota	1985-86	Teaching assistant for 3-quarter honors freshman physics (lab instruction and grading)
Dept. of ChemEng./MatSci. University of Minnesota	1987-1991	Teaching assistant for 4 different undergraduate MatSci courses (one course per academic year; lab instruction and grading)
Center for Interfacial Engineering University of Minnesota	Jan. 1993 – Aug. 1993	Research advisor for one undergraduate
Center for Interfacial Engineering University of Minnesota	Dec. 1994 – Dec. 1997	Ion beam analysis user training sessions (approximately 40 individuals, 1-3 per session)
Center for Interfacial Engineering	Sept. 18, 1995	Ion beam analysis master class: organized & presented

University of Minnesota		(lectures and lab session)
Dept. of Chemistry University of Minnesota	spring quarter 1996	Chem8136: Surface and interface analysis (graduate curriculum) (students: Chemistry, Physics, CEMS, and Mech. Eng. Depts.)
Center for Interfacial Engineering University of Minnesota	Sept. 1996 – June 1997	Research advisor for one undergraduate
Center for Interfacial Engineering University of Minnesota	May 22-23, 1998	Scanning probe microscopy master class: organized & presented (lectures and lab session)
Dept. of Chemistry University of Minnesota	Spring 1995 – ongoing	Co-advisor for 4 Ph. D. theses
Center for Interfacial Engineering University of Minnesota	June 1997 – ongoing	Scanning probe microscopy user training sessions (includes application note and instructions development; approximately 75 individuals, 1-2 per session)
Dept. of Chemistry University of Minnesota	spring quarter 1999	Chem8136: Surface and interface analysis (graduate curriculum)
Dept. of Chemistry University of Minnesota	spring semester 2000	Chem5210: Materials Characterization (graduate curriculum)
Dept. of Chemistry University of Minnesota	spring semester 2001	Chem5210: Materials Characterization (graduate curriculum)
Dept. of Chemistry University of Minnesota	spring semester 2005	Chem5210: Materials Characterization (graduate curriculum)
Dakota County Technical College	fall semester 2005	Nano 2121: Nanomaterials
Dept. of Chemistry University of Minnesota	spring semester 2006	Chem5210: Materials Characterization (graduate curriculum)
College of Continuing Education University of Minnesota	spring semester 2006	MT 3131-2: Introduction to Materials Characterization and Materials Characterization Lab
College of Continuing Education University of Minnesota	summer semester 2006	MT 3131-2: Introduction to Materials Characterization and Materials Characterization Lab
Dakota County Technical College	fall semester 2006	Nano 2121: Nanomaterials

Consulting

<u>Company</u>	<u>Dates</u>	<u>Proprietary research topic</u>
Sterling Diagnostic Imaging	1995-1997	imaging media
Honeywell	1997	aviation-guidance devices
SurModics	2001	surface coatings for biocompatibility
Ciba Vision	2002	soft contact lens coatings
Boston Scientific	2003-2005	cardiovascular insert drug-eluting coatings
Nanocopoeia	2004-2005	drug-eluting biocompatible coatings
Entegris	2005	polymer abrasion

