

James W. Schneider

Professor, Department of Chemical Engineering
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Education

Ph.D. Chemical Engineering, University of Minnesota (1998)
Thesis: *Force and Adhesion Measurements between Protein Functional Units*
Advisors: Prof. Matthew Tirrell and Prof. Robert Tranquillo
B.S. Chemical Engineering, University of Wisconsin (1992)

Professional Experience

Professor, Department of Chemical Engineering
Carnegie Mellon University, Pittsburgh PA (2008-present)
Professor (courtesy), Department of Biomedical Engineering
and Department of Chemistry (2008-present)
Associate Professor, Department of Chemical Engineering
Carnegie Mellon University, Pittsburgh PA (2004-2008)
Associate Professor (courtesy), Department of Biomedical Engineering
Carnegie Mellon University, Pittsburgh PA (2004-2008)
Associate Professor (courtesy), Department of Chemistry
Carnegie Mellon University, Pittsburgh PA (2006-2008)
Assistant Professor, Department of Chemical Engineering
Carnegie Mellon University, Pittsburgh PA (1999-2004)
Assistant Professor (courtesy), Department of Biomedical Engineering
Carnegie Mellon University, Pittsburgh PA (2002-2004)
Postdoctoral Fellow, Chemistry Division
Naval Research Laboratory, Washington DC (1998-1999)
Research Assistant, Department of Chemical Engineering and Materials Science
University of Minnesota, Minneapolis MN (1992-1998)
Engineering Intern
General Mills, Inc., Minneapolis MN (Summer 1991)
Research Assistant, Department of Chemical Engineering
University of Wisconsin, Madison WI (1990-1991)

Honors and Awards

Kun Li Award for Excellence in Education (2005)
Beckman Young Investigator Award (2002)
CAREER Award, National Science Foundation (2001)
Postdoctoral Fellowship, American Society for Engineering Education (1998-1999)
Kodak Fellowship, Eastman Kodak Co. (1993-1997)
National Merit Scholar (1988-1992)
Dow Outstanding Junior in Chemical Engineering (1991)

Publications

1. "Quasi-Equilibrium AFM Measurement of Disjoining Pressure in Lubricant Nanofilms II: Effect of Substrate Materials," A.P. Bowles, Y.T. Hsia, P.M. Jones, L.R. White, and J.W. Schneider, *Langmuir* 25:2101-2106 (2009).
2. "Length-Dependent DNA Separations using Multiple End-attached Peptide Nucleic Acid Amphiphiles in Micellar Electrokinetic Chromatography," J.M. Savard, S.T. Grosser, and J.W. Schneider, *Electrophoresis* 29:2779-2789 (2008).
3. "Free Solution Electrophoresis of Alkylated DNA in the Presence of Interacting Micelles," S.T. Grosser, J.M. Savard, and J.W. Schneider, in preparation for *J. Am. Chem. Soc.* (2008).
4. "Peptide Nucleic Acids," C. Achim, B.A. Armitage, D.H. Ly, and J.W. Schneider, in *Wiley Encyclopedia of Chemical Biology*, Wiley: Hoboken, NJ. (2008).
5. "Identification of PCR Products using Peptide Nucleic Acid Amphiphiles in Micellar Electrokinetic Chromatography," S.T. Grosser, J.M. Savard, and J.W. Schneider, *Anal. Chem.* 79:9513-9519 (2007).
6. "High Capacity, Charge-Selective Protein Uptake by Polyelectrolyte Brushes," A. Kusumo, L. Bombalski, Q. Lin, K. Matyjaszewski, J.W. Schneider, and R.D. Tilton, *Langmuir* 23:4448-4454 (2007).
7. "Sequence-Specific Purification of DNA Oligomers in Hydrophobic Interaction Chromatography using Peptide Nucleic Acid Amphiphiles: Extended Dynamic Range," J.M. Savard and J.W. Schneider, *Biotech. Bioeng.* 97:367-376 (2007).
8. "Morphological Characterization of Self-Assembled Peptide Nucleic Acid Amphiphiles," C. Lau, R. Bitton, H. Bianco-Peled, D.G. Schultz, D.J. Cookson, S.T. Grosser, and J.W. Schneider, *J. Phys. Chem. B* 110:9027-9033 (2006).
9. "A Tapping-Mode AFM Study of the Compression of Grafted Poly(ethylene glycol) Chains," I.M. Nnebe and J.W. Schneider, *Macromolecules* 39:3616-3621 (2006).
10. "Effect of Electrostatic Interactions on Binding and Retention of DNA Oligomers to PNA Liposomes Assessed by FRET Measurements," B.F. Marques and J.W. Schneider, *Coll. Surf. B: Biointerfaces* 53:1-8 (2006).
11. "Quasi-Equilibrium AFM Measurement of Disjoining Pressure in Lubricant Nanofilms I: Fomblin Z03 on Silica," A.P. Bowles, Y.T. Hsia, P.M. Jones, J.W. Schneider, and L.R. White, *Langmuir* 22:11436-11446 (2006).
12. "Sequence-Specific Binding of DNA to Liposomes Containing di-Alkyl Peptide Nucleic Acid (PNA) Amphiphiles," B.F. Marques and J.W. Schneider, *Langmuir* 21:2488-2494 (2005).
13. "Thermodynamic and Structural Characterization of Amino Acid-Linked Dialkyl Lipids," S. Tristram-Nagle, R.N.A.H. Lewis, J.W. Blickenstaff, M. DiPrima, B.F. Marques, R.N. McElhaney, J.F. Nagle, and J.W. Schneider, *Chem. Phys. Lipids* 134:29-39 (2005).
14. "Measurement of Disjoining Pressure of Z-type Perfluoropolyether Lubricants on Si and SiN_x Surfaces," P.M. Jones, M. Luo, L.R. White, J. Schneider, M.L. Wu, C. Platt, L. Li, and Y.T. Hsia, *Tribology International* 38:528-532 (2005).
15. "Peptide Nucleic Acid (PNA) Amphiphiles: Synthesis, Self-Assembly, and Duplex Stability," J.P. Vernille, L.C. Kovell, and J.W. Schneider, *Bioconj. Chem.* 15:1314-1321 (2004).

16. "Sequence-Specific Purification of Oligonucleotides using Peptide Nucleic Acid Amphiphiles in Hydrophobic Interaction Chromatography," J.P. Vernille and J.W. Schneider, *Biotechnol. Prog.* 20:1776-1782 (2004).
17. "Characterization of Distance-Dependent Damping in Tapping-Mode AFM Force Measurements in Liquid," I. Nnebe and J.W. Schneider, *Langmuir* 20:3195-3201 (2004).
18. "Direct Force Measurement of the Stability of Poly(ethylene glycol)-Poly(ethylenimine) Graft Films," I. Nnebe, R.D. Tilton, and J.W. Schneider, 276:306-316 *J. Coll. Int. Sci.* (2004).
19. "Dynamic Atomic Force Microscopy Studies to Characterize Heterogeneous Surfaces," I. Nnebe and J.W. Schneider. In *Marcel-Dekker Encyclopaedia of Nanoscience and Nanotechnology*. New York: Marcel-Dekker (2004).
20. "Peptide Nucleic Acid Conjugates in Biotechnology," J. Schneider. In *Biomimetic Materials and Design: Biointerfacial Strategies, Tissue Engineering and Targeted Drug Delivery*, A.K. Dillow and A.M. Lowman, eds. New York: Marcel-Dekker (2002).
21. "Nanometer Scale Surface Properties of Supported Lipid Bilayers Measured with Hydrophobic and Hydrophilic Atomic Force Microscope Probes," J. Schneider, W. Barger, and G.U. Lee, *Langmuir* 19: 1899-1907 (2003).
22. "Surface Force Measurements of Electrostatic and Hydrogen Bonding Interactions between Bilayers of Glycine Amphiphiles," J. Schneider, P. Berndt, K. Haverstick, S. Kumar, S. Chiruvolu, and M. Tirrell, *Langmuir* 18: 3923-3931 (2002).
23. "Force Titration of Langmuir-Blodgett Bilayers of Glycine Amphiphiles: JKR-Type Measurements Using the Surface-Force Apparatus," J. Schneider, Y. Dori, K. Haverstick, M. Tirrell, and R. Sharma. *Langmuir* 18: 2702-2709 (2002).
24. "Structural Study of Langmuir Monolayers Containing Lipidated Poly(ethylene glycol) and Peptides," H. Bianco-Peled, Y. Dori, J. Schneider, L.P. Sung, S. Satija, M. Tirrell. *Langmuir* 17: 6931-6937 (2001).
25. "Atomic Force Microscope Image Contrast Mechanisms on Supported Lipid Bilayers," J. Schneider, Y.F. Dufrêne, W.R. Barger, and G.U. Lee. *Biophys. J.* 79:1107-1118 (2000).
26. "Direct Measurement of Molecular-Level Forces and Adhesion in Biological Systems," J. Schneider and M. Tirrell. *Drugs Pharm. Sci.* 98: 223-259 (1999).
27. "Development and Characterization of Surface Chemistries for Silicon-Based Biosensors," S.W. Metzger, M. Natesan, C. Yanavich, J. Schneider, and G.U. Lee. *J. Vac. Sci. Technol. A* 17: 2623-2628 (1999).
28. "Characterization of the Physical Properties of Model Membranes at the Nanometer Scale with the Atomic Force Microscope," Y.F. Dufrêne, T. Boland, J.W. Schneider, W.R. Barger, and G.U. Lee. *Faraday Disc.* 111:79-94 (1998).
29. "Effect of Substrate Anchoring on the Mechanical Strength of Langmuir-Blodgett Bilayers," J. Schneider, Y. Dori, M. Tirrell, and R. Sharma. *Thin Solid Films* 327-329: 772-777 (1998).
30. "Force and Adhesion Measurements between Hydrogen-Bonded Layers of Glycine-Functionalized Amphiphiles," J. Schneider, P. Berndt, K. Haverstick, S. Kumar, S. Chiruvolu, and M. Tirrell. *J. Am. Chem. Soc.* 120:3508-3509 (1998).

31. "Adsorption of Hydrophilic-Hydrophobic Block Copolymers on Silica from Aqueous Solutions," C. Amiel, M. Sikka, J.W. Schneider, Y.-H. Tsao, M. Tirrell, and J.W. Mays. *Macromolecules* 28:3125-3134 (1995).

Invited Lectures

1. "Electrophoretic Mobility of Transiently Formed Micelle-DNA Polyampholytes," *ACS Award in Colloid and Surface Chemistry Symposium Honoring Lee White, 234th ACS National Meeting*, New Orleans LA (Apr. 2008).
2. "Rapid Electrophoretic Analysis of DNA Sequencing Products using Transiently Attached Micelles," *Herbert D. Doan Endowed Nanotechnology Symposium*, University of Michigan, Ann Arbor MI (Mar. 2008).
3. "Genomic and Gene Expression Analysis using Self-Assembled Amphiphilic Materials," *Nano@Wayne Seminar Series*, Wayne State University, Detroit MI (Jan. 2008).
4. "Genomic and Gene Expression Analysis using Self-Assembled Amphiphilic Materials," Department of Chemical and Biological Engineering, Polytechnic University, New York NY (Sept. 2007).
5. "Surfactant Micelles as Bioseparation Media: Identification and Purification of DNA using Amphiphilic Sequence Tags," Department of Chemical Engineering, City College of New York, New York NY (Nov. 2006).
6. "Isolation and Concentration of Biomarkers Using Self-Assembled Nanomaterials," Bionanotechnology Session (Plenary), *AIChE Annual Meeting*, San Francisco CA (Nov. 2006).
7. "Adsorption and Binding of DNA to Functionalized Surfactant Micelles and Liposomes," Department of Physics, Georgetown University (Sept. 2005).
8. "Partitioning of PNA between Aqueous and Nonpolar Phases," Los Alamos National Laboratory, Los Alamos NM (July 2005).
9. "Self-Assembly of Peptide Nucleic Acid Amphiphiles in the Presence of DNA," *229th ACS National Meeting*, San Diego CA (Mar. 2005).
10. "Purification and Concentration of DNA by Surfactant Hybridization," Los Alamos National Laboratory, Los Alamos NM (Jan. 2005).
11. "Purification and Concentration of DNA by Surfactant Hybridization," Dept. Chemical Engineering, Tulane University, New Orleans LA (Nov. 2004).
12. "Purification and Concentration of DNA by Surfactant Hybridization," Dept. Chemical Engineering, McGill University, Montreal QC (Oct. 2004).
13. "Dynamic Mechanical Probing of Soft Surfaces Using AFM," *AIChE Annual Meeting*, San Francisco CA (Nov. 2003).
14. "Peptide Amphiphiles as Biomimetic Materials," *Air Force Cell-Like Entity Biotechnology Symposium*, Dayton OH (June 2003).
15. "Surfactant-Based DNA Extraction Processes," *Transport Phenomena and Separation Processes Session, 3rd Chemical Engineering Conference for Collaborative Research in Eastern Mediterranean*, Thessaloniki Greece (May 2003).
16. "Manipulating and Processing Genetic Material Using Surfactant Systems," Dept. Chemical Engineering, University of Delaware, Newark DE (Mar. 2003).
17. "Manipulating and Processing Genetic Material Using Surfactant Systems," Dept. of Chemistry, University of Melbourne, Melbourne Australia (Feb. 2003).

18. "Genomic Processing and Detection Using Surfactant Systems," *Australian Colloid and Interface Symposium*, (Keynote) Sydney Australia (Feb. 2003).
19. "Manipulating and Processing Genetic Material Using Surfactant Systems," Dept. Chemical Engineering, Rensselaer Polytechnic Institute, Troy NY (Nov. 2002).
20. "Genomic Processing and Detection Using Surfactant Systems," Dept. Chemical Engineering, University of Kentucky, Lexington KY (Oct. 2002).
21. "Nucleic Acid Separations: Opportunities and Challenges," *Future of Biochemical Engineering Symposium, 224th ACS National Meeting*, Boston MA (Aug. 2002).
22. "Sequence-Specific Nucleic Acid Separations Using PNA Amphiphiles," *Gordon Research Conference: Chemistry at Interfaces*, New London CT (July 2002).
23. "Microscale Unit Operations in Chemical Engineering," *11th Annual Adler Lecture*, Dept. of Chemical Engineering, Case Western Reserve University, Cleveland OH (Apr. 2002).
24. "Sequence-Specific Nucleic Acid Separations Using PNA Amphiphiles," Dept. Chemical Engineering, Case Western Reserve University, Cleveland OH (Apr. 2002).
25. "Dynamic Mechanical Probing of Soft Materials Using AFM," Unilever Corp., Edgewater NJ (Mar. 2002).
26. "Peptide Nucleic Acid Amphiphiles in Biotechnology," Dept. Chemical Engineering, Drexel University, Philadelphia PA (Oct. 2000).
27. "Characterization of Polymeric and Biological Surfaces Using AFM," Aristech Inc., Pittsburgh PA (Jan. 2000).
28. "Forces between Biomembranes and AFM Probes: Influence of Probe Chemistry" Dept. Chemistry, George Mason University, Fairfax VA (Mar. 1999).

Conference Presentations (speaker underlined, last five years)

1. "Characterization of Colloidal Dispersions using Transiently Attached Alkylated DNA in Capillary Electrophoresis," J.W. Schneider, J.M. Savard, D. Nelles, and S. Istivan, *AIChE Annual Meeting*, Philadelphia PA (2009).
2. "Wetting Dynamics of Bonded Perfluoropolyether (PFPE) Thin Films Revealed by AFM," A.P. Bowles, J.W. Schneider, and L.R. White, *AIChE Annual Meeting*, Philadelphia PA (2009).
3. "Effect of Serum Contaminants on the Detection of DNA & RNA Using Surfactant Probes in Capillary Electrophoresis," O. Selivanova and J.W. Schneider, *AIChE Annual Meeting*, Philadelphia PA (2009).
4. "Rapid Separation of DNA Oligomers using Transiently Attached Micelles and Nanoemulsion Droplets in Capillary Electrophoresis," J.W. Schneider, J.M. Savard, S. Istivan, and O. Selivanova, *82nd Colloid & Surface Science Symposium*, Raleigh NC (2008).
5. "Controlling Parameters for Protein Binding by Cationic Polyelectrolyte Brushes," A. Kusumo, H. Dong, P. M. Biesheuvel, K. Matyjaszewski, J. W. Schneider, and R. D. Tilton, *82nd Colloid & Surface Science Symposium*, Raleigh NC (2008).
6. "Wetting Dynamics of Bonded PFPE Thin Films Revealed by AFM: Apparent Expansion on Compression," J.W. Schneider, A.P. Bowles, and L.R. White, *82nd Colloid & Surface Science Symposium*, Raleigh NC (2008).

7. "Hybrid Bilayers Hosting PNA Surfactants: DNA Binding Kinetics, Selectivity, and Surface Diffusion," T.J. Crites and J.W. Schneider, *82nd Colloid & Surface Science Symposium*, Raleigh NC (2008).
8. "Co-assembly of Alkylated DNA Oligomers and Nonionic Surfactants," S.T. Grosser, J.M. Savard, and J.W. Schneider, *81st Colloid & Surface Science Symposium*, Newark DE (2007).
9. "Interfacial Polyelectrolyte Structures for Tunable Protein Uptake," A. Kusumo, H. Dong, J. Huang, Q. Lin, K. Matyjaszewski, T. Kowalewski, J.W. Schneider, and R.D. Tilton, *81st Colloid & Surface Science Symposium*, Newark DE (2007).
10. "Separation of PCR Products using Alkane-tagged Primers in Micellar Electrokinetic Chromatography," S.T. Grosser, J.M. Savard, and J.W. Schneider, *233rd ACS National Meeting*, Chicago IL (2007).
11. "Separation and Identification of Biomolecules using Nucleic-Acid Amphiphiles in Micellar Electrokinetic Chromatography," J.W. Schneider, J.M. Savard, and S.T. Grosser, *1st International Conference on Biomolecular Engineering, AIChE Society for Biological Engineering*, San Diego CA (2007).
12. "Adsorption of Hydrophobically Modified DNA to Micelles, Liposomes, and Microemulsions," S.T. Grosser, J.M. Savard, and J.W. Schneider, *AIChE Annual Meeting*, San Francisco CA (2006).
13. "High Capacity, Charge-Selective Protein Binding in Thermally Responsive Annealed Polyelectrolyte Graft Layers," A. Kusumo, L. Bombalski, J.W. Schneider, K. Matyjaszewski, Q. Lin, and R.D. Tilton, *80th ACS Colloid and Surface Science Symposium*, Boulder CO (2006).
14. "Time-Dependent Effects in AFM Measurements of Disjoining Pressure of PFPE Films," A.P. Bowles, J.W. Schneider, L.R. White, and P.M. Jones, *AIChE Annual Meeting*, Cincinnati OH (2005).
15. "Polymer Brushes with High Protein-Binding Capacity Based on Poly(dimethylamino ethylmethacrylate)," A. Kusumo, L. Bombalski, Q. Lin, T. Kowalewski, K. Matyjaszewski, J.W. Schneider, and R.D. Tilton, *AIChE Annual Meeting*, Cincinnati OH (2005).
16. "Back-Extraction of PNA Affinity Tags following HIC Purification of DNA Targets," J.M. Savard and J.W. Schneider, *AIChE Annual Meeting*, Cincinnati OH (2005).
17. "Surface Diffusion of DNA Oligonucleotides on Patterned Silane Surfaces," T. Crites and J.W. Schneider, *AIChE Annual Meeting*, Cincinnati OH (2005).
18. "Synchrotron X-ray Characterization of PNA-Amphiphile Micelles," S.T. Grosser, C. Lau, and J.W. Schneider, *AIChE Annual Meeting*, Cincinnati OH (2005).
19. "Binding of Target DNA with Overhanging Bases to DNA Probes in Lipid Bilayers and Micelles," B.F. Marques, S.T. Grosser, and J.W. Schneider, *AIChE Annual Meeting*, Cincinnati OH (2005).
20. "Sequence Specific Separation of Target DNA in Micellar Electrokinetic Chromatography," S.T. Grosser and J.W. Schneider, *AIChE Annual Meeting*, Cincinnati OH (2005).
21. "Oligonucleotide Purification by Selective Micelle Partitioning in Capillary Electrophoresis," S.T. Grosser, O. Selivanova, and J.W. Schneider, *13th International Conference on Biopartitioning and Purification*, Amsterdam Netherlands (2005).

22. "DNA Separations using Peptide Nucleic Acid Amphiphiles as Affinity Tags in Hydrophobic Interaction Chromatography," J.M. Savard and J.W. Schneider, *13th International Conference on Biopartitioning and Purification*, Amsterdam Netherlands (2005).
23. "Sequence Specific Separation of Target DNA in Micellar Electrokinetic Chromatography," S.T. Grosser and J.W. Schneider, *229th ACS National Meeting*, San Diego CA (2005).
24. "Electrostatic and Hydrophobic Interactions of DNA Oligomers with Peptide Nucleic Acid (PNA) Liposomes (poster)," B.F. Marques and J.W. Schneider, *229th ACS National Meeting*, San Diego CA (2005).
25. "DNA Detection with Fluorescently Tagged Surfactant Microstructures (poster)," B.F. Marques and J.W. Schneider, *229th ACS National Meeting*, San Diego CA (2005).
26. "Affinity Ligands for Sequence-Specific Duplex DNA Separation in Hydrophobic Interaction Chromatography," J.W. Schneider, J.P. Vernille, and J. Savard, *AIChE Annual Meeting*, Austin TX (2004).
27. "Probing Receptor-Ligand Interactions in Thin Polymer Films using Tapping Mode AFM," J.W. Schneider and I. Nnebe, *AIChE Annual Meeting*, Austin TX (2004).
28. "Morphological Characterization of Self-Assembled Peptide Nucleic Acid Amphiphiles," C. Lau, R. Bitton, H. Bianco-Peled, and J.W. Schneider, *AIChE Annual Meeting*, Austin TX (2004).
29. "Solubility and Phase Behavior of Peptide Nucleic Acid Amphiphiles (poster)," C. Lau and J.W. Schneider, *AIChE Annual Meeting*, Austin TX (2004).
30. "Front-End Processing of Cell Lysates for Enhanced Chip-Based Detection," J.W. Schneider and T. Mukherjee, *DARPA SIMBIOSYS PI Meeting*, Vail CO (2004).
31. "DNA Hybridization to Peptide Nucleic Acid Micelles and Liposomes: Effect of Alkane Chain Length on CMC and Electrophoretic Mobility (poster)," J.W. Schneider, C. Lau, B.F. Marques, and S. Grosser, *Gordon Research Conference: Chemistry at Interfaces*, Meriden NH (2004).
32. "Morphological Characterization of Mixed Peptide-Amphiphile Micelles (poster)," C. Lau, R. Bitton, S. Grosser, H. Bianco-Peled, and J.W. Schneider, *228th ACS National Meeting*, Philadelphia PA (2004).
33. "Peptide Nucleic Acid Micelles as DNA probes in Capillary Electrophoresis," S.T. Grosser and J.W. Schneider, *78th ACS Colloid and Surface Science Symposium*, New Haven CT (2004).
34. "Sequence Labels for DNA Using Peptide Nucleic Acid (PNA) Surfactant Assemblies," B.F. Marques and J.W. Schneider, *78th ACS Colloid and Surface Science Symposium*, New Haven CT (2004).
35. "Front-End Processing of Cell Lysates for Enhanced Chip-Based Detection," J.W. Schneider and T. Mukherjee, *DARPA SIMBIOSYS PI Meeting*, Palm Springs CA (2004).

Funded Proposals (Single PI)

1. "Rapid, Gel-Free Sequencing of DNA using Surfactant Micelles," Berkman Faculty Development Fund (CMU), \$5,000 (4/07-4/08).
2. "Partitioning of Single-stranded PNA and Double-stranded PNA between Aqueous and Nonpolar Phases," Los Alamos National Laboratory, \$14,000 (6/05-8/05).
3. "Bio-Conjugated Nanocrystals for FRET-Based Detection," NIST, \$31,029 (2/05-6/05).
4. "Travel Funds for Australian Colloid and Interface Symposium," Berkman Faculty Development Fund (CMU), \$1,750 (11/02-10/03).
5. "Novel Nucleic Acid Separations for Microchip Analysis and Plasmid Purification," Beckman Young Investigator Award, \$240,000 (9/02-8/05).
6. "Probing Single-Molecule Binding and Steric Stabilization Forces in Bioactive Polymer Films Using Dynamic AFM," ACS Petroleum Research Fund, \$35,000 (9/02-8/04).
7. "NER: Chemical Probing of Biosensor Nano-environments Using Dynamic AFM," NSF-CTS-0210205, \$100,000 (8/02-7/03).
8. "Sequence-Specific Enrichment of DNA for Quantitative PCR," DCI Postdoctoral Program, \$300,000 (5/02-4/05).
9. "CAREER: Aqueous Two-Phase Separation of DNA Using PNA-Conjugated Amphiphiles," NSF-BES-0093538, \$375,000 (2/01-1/06).
10. "CAREER: Aqueous Two-Phase Separation of DNA Using PNA-Conjugated Amphiphiles (REU Supplement)," NSF-BES-0093538, \$5,625 (2/01-1/06).
11. "CAREER: Aqueous Two-Phase Separation of DNA Using PNA-Conjugated Amphiphiles (REU Supplement)," NSF-BES-0093538, \$5,625 (2/01-1/06).
12. "CAREER: Aqueous Two-Phase Separation of DNA Using PNA-Conjugated Amphiphiles (REU Supplement)," NSF-BES-0093538, \$5,625 (2/01-1/06).
13. "Solid-State Membranes for the Direct Measurement of Protein-Membrane Interactions," Berkman Faculty Development Fund (CMU), \$4,400 (12/99-12/00).

Funded Proposals (PI on a Multiple PI),

1. "Bonding and Flow Properties of Disk-Drive Lubricant Films Assessed by Atomic Force Microscopy," Pennsylvania Infrastructure Technology Alliance (PITA), \$67,338 (1/1/08-5/31/09); Lee White co-PI.
2. "MRI: Development of Fluorescence-Based Spectroscopy and Imaging Microfluidics System for Surface Chemical and Geometric Optimization," NSF-CTS-0320548, \$106,400 (9/03-8/04); Steinar Hauan, Robert Tilton, and Qiao Lin, co-PIs.
3. "MRI: Development of Fluorescence-Based Spectroscopy and Imaging Microfluidics System for Surface Chemical and Geometric Optimization (REU Supplement)," NSF-CTS-0320548, \$6,000 (9/03-8/04); Steinar Hauan, Robert Tilton, and Qiao Lin, co-PIs.
4. "Front-End Processing of Cell Lysates for Enhanced Chip-Based Detection," AFOSR/DARPA, \$664,513 (3/03-2/06); Tamal Mukerjee co-PI.

Funded Proposals (co-PI on a Multiple PI)

1. "MRI: Acquisition of SAXS for Nanostructural Characterization of Self-Assembled Materials," NSF-CTS-0521079, \$430,350 (6/05-5/08); Lynn Walker, PI; Michael Bockstaller and Tomasz Kowalewski, co-PIs.
2. "NIRT: Nanoengineered Responsive Polymer Surfaces for Micro/Nanofluidic Bioanalytical Systems," NSF-CTS-0304568, \$999,996 (9/03-8/07); Qiao Lin, PI; Krzysztof Matyjaszewski, Robert Tilton, and Lee White, co-PIs.
3. "Detection and Control of Pharmaceutical Polymorphism," CMU Innovation Seed Fund, \$74,240 (9/02-8/03); Robert Suter, PI; David Sholl, Todd Przybycien, and Robert Tilton, co-PIs.
4. "Direct Measurement of Disjoining Pressure in Nanofilms," Seagate Corp. \$224,000 (1/02-12/05); Lee White, PI.
5. "Measurement of Steric Stabilization Forces in Polymer Melts with Colloidal-Probe AFM," Bayer Corp. \$8,000 (3/00), Dennis Prieve, PI; Robert Tilton and Lee White, co-PIs.
6. "Synthesis and Characterization of Thermoreversible Polymer Gels Based on Biomolecular Recognition," CMU Innovation Seed Fund, \$33,000 (1/00-12/00); Bruce Armitage, PI; Guy Berry and Gary Patterson, co-PIs.

Professional Service

Peer reviewing

- Archival journals: *Analytical Chemistry*, *Biotechnology and Bioengineering*, *Biomacromolecules*, *Chemical Communications*, *Colloids and Surfaces*, *Electrophoresis*, *Journal of the American Chemical Society*, *Journal of Chromatography A*, *Journal of the American Medical Association*, *Journal of Macromolecular Science*, *Journal of Molecular Recognition*, *Langmuir*, *Science*
- Proposals: CRDF, NSF-IDBR, NSF-CBET, Petroleum Research Fund, Air Force Office of Scientific Research, Natural Sciences and Engineering Research Council of Canada (NSERC), Arnold and Mabel Beckman Foundation, Portuguese Foundation for Science and Technology (FCT)

Consulting

- Lubrizol Corporation, Wickliffe OH
- Unilever Corporation, Edgewater NJ
- Sunoco Chemicals, Pittsburgh PA

Membership in Professional Societies

- American Institute of Chemical Engineers (AIChE)
- American Chemical Society (ACS)

Service in Professional Societies

- Alternate Councilor, ACS Colloid and Surface Chemistry Division (2009)
- Past Chair, AIChE Pittsburgh Local Section (2005-2006)
- Chair, AIChE Pittsburgh Local Section (2004-2005)
- Vice-Chair, AIChE Pittsburgh Local Section (2003-2004)

Scientific Meeting Organization

- National Programming Chair, AIChE Division 15 (2009).
- National Programming Vice-Chair, AIChE Division 15 (2008).
- National Programming Chair, AIChE Area 15c (2006).
- National Programming Vice-Chair, AIChE Area 15c (2005).
- Session Chair, *AIChE Annual Meeting* (“Biomolecules at Interfaces,” Area 1c), Cincinnati OH (2005).
- Session Chair, *AIChE Annual Meeting* (“Biomolecules at Interfaces,” Area 1c), Austin TX (2004).
- Session Vice-Chair, *AIChE Annual Meeting* (“Biomimetic Interfaces,” Area t7), Austin TX (2004).
- Session Chair, *AIChE Annual Meeting* (“Nanoscale Interfacial Fundamentals,” Area t1), San Francisco CA (2003).
- Symposium Organizer, *226th ACS National Meeting* (“Nanoscale Imaging of Biological Surfaces,” Division of Colloid and Surface Science), New Orleans LA (2003).
- Session Vice-Chair, *AIChE Annual Meeting* (“Fundamentals in Interfacial Phenomena,” Area 1c), Indianapolis IN (2002).
- Session Vice-Chair, *AIChE Annual Meeting* (“Nanoscale Interfacial Fundamentals,” Area t1), Indianapolis IN (2002).
- Session Vice-Chair, *AIChE Annual Meeting* (“Fundamentals in Interfacial Phenomena,” Area 1c), Reno NV (2001).
- Session Co-Chair and Exhibit Organizer, *75th ACS Colloid and Surface Science Symposium*, Pittsburgh PA (2001).
- Session Vice-Chair, *AIChE Annual Meeting* (“Fundamentals in Interfacial Phenomena,” Area 1c), Los Angeles CA (2000).

Carnegie Mellon University

- CIT Promotion and Tenure Committee (2008-2009)
- Faculty Advisor, Tau Beta Pi (2006-2007)
- Dept. of Civil and Environmental Engineering Faculty Search Committee (2005-2006)
- Chair, University Laboratory Safety Committee (2004-2005)
- CPS Seminar Organizer (Spring 2004, Spring 2007)
- Dept. of Physics Faculty Search Committee (2003-2004)
- Dept. of Biomedical Engineering Faculty Search Committee (2003)

Carnegie Mellon University, Dept. of Chemical Engineering

- Director of Graduate Admissions (2005-2008)
- Graduate Recruiting Committee (2004-2008)
- AIChE Student Chapter Advisor (2001-2007)
- Bio-X Committee (2002-2004)
- Ph.D. Qualifying Committee (2000-2001, 2006, 2008)
- Safety Committee (2000, 2003-2006)
- Department Seminar Series Organizer (Fall 2000, Fall 2005)

Teaching/Mentoring

Postdoctoral Researchers Advised

- *Morphology and Composition of Mixed Peptide-Surfactant Micelles for Bioseparations* (Dr. Hoi-Sze Lau, 2003-2005)
- *Nucleic-Acid Extraction and Enrichment for Improved Genomic Sensing of Pathogens* (Dr. Ed Horsey, 2003-2005)

Thesis Projects Advised

- *Sequence-Specific Purification of Nucleic Acids Using PNA Amphiphiles* (James Vernille, Ph.D. 2004)
- *Dynamic Mechanical Probing of Biosensor Surfaces* (Ijeoma Nnebe, Ph.D. 2004)
- *Surfactant Microstructures as DNA Sequence Tags* (Bruno Marques, Ph.D. 2005)
- *Hydrophobically Modified Nucleic Acids in Micellar Electrokinetic Chromatography* (Shane Grosser, Ph.D. 2007)
- *Micellar and Chromatographic Media for Surfactant-Based DNA Analysis and Purification Processes* (Jeff Savard, Ph.D. 2008)
- *Surface Diffusion of Oligonucleotides on Patterned Substrates* (Travis Crites, Ph.D. expected 2008)
- *High Capacity Polyelectrolyte Brushes for Tuning Protein Adsorption* (Andy Kusumo, Ph.D. 2008, with R. Tilton)
- *Spreading Behavior of End-functionalized PFPE Lubricants Assessed using AFM* (Adam Bowles, Ph.D. expected 2009, with L. White)
- *Quantification of Gene Expression using Surfactant-Based Array Methods* (Oxana Selivanova, Ph.D. expected 2009)
- *DNA Sequencing using Nanoemulsion Tags* (Stephen Istivan, Ph.D. expected 2012)
- *Rate of Solute Exchange in Micellar Electrokinetic Chromatography* (Angela Holmen, Ph.D. expected 2013)
- *Self-Assembled Monolayers of Poly(glycine) Alkanethiols on Gold* (Chang Hoon Lee, M.S. 2003)
- *Direct Measurement of Disjoining Pressure in Disk-Drive Lubricant Films* (Min Luo, M.S. 2004, with L. White, Chem. Engr.)

- *Electrostatic Control of Liposomal Drug Release* (Chindarat Winyarat, M.S. 2004)
- *Investigation of AFM to Evaluate Commercially Available Polypropylene Copolymers* (Andrew Schnitgen, CPS Masters 2000, with A. Jacobson, Chem. Engr.)

Undergraduate Projects

- *Partitioning of Sequencing Dye Terminators to MEKC Micelles* (David Nelles, Fall 2007-Spring 2008, Spring 2009)
- *Step-Gradient Elution of Alkylated DNA in Micellar Electrokinetic Chromatography* (Arianna Gutierrez, Fall 2008)
- *Rod-like Micelles for Electrophoretic DNA Separations* (Lauren Brown, Fall 2008)
- *Electrophoretic Sorting of Carbon Nanotubes by DNA-Surfactant Tagging* (Katherine Song, NSF REU Researcher, Summer 2008).
- *Purification of Carbon Nanotubes using Alkylated DNA* (Chrystal Chan, Summer 2007)
- *Molecular-Beacon PNA Amphiphiles for micro-RNA Detection* (Miriam Cha, Summer 2007)
- *Effect of RNA Secondary Structure on Binding of Affinity Tags and their Adsorption to Micelles* (Apiradee Honglawan, Senior Honors Thesis Project, Fall 2006-Spring 2007)
- *Use of Chaotropic and Kosmotropic Buffers to Modulate DNA Surface Diffusion on Self-Assembled Monolayers* (Natasha Sachdeva, Fall 2006)
- *Phase Transitions of Surface-Bound Thermoresponsive Polymers using Quartz-Crystal Microgravimetry* (Gloria Kim, Chem. Engr. Dept. Fellowship, Summer 2005, Fall 2006, Spring 2007)
- *Separation of Serum Proteins from DNA in Batch-Mode Hydrophobic Interaction Chromatography* (Kamy Somasundaram, Summer 2006)
- *Batch-Mode Hydrophobic Interaction Chromatography for ssDNA Purifications* (Holda Puron, Summer 2006)
- *Adsorption of DNA with Multiple Surfactant Tags to Micelles* (Chelsea Marsh, Summer 2006)
- *Wetting Properties of Perfluoropolyethers on Self-Assembled Monolayers* (Nick Chidiac, Summer 2006)
- *Liposome Electrokinetic Chromatography for DNA Analysis* (Chana Fuhrman, Summer 2006)
- *Phase Behavior of Fluorescently-Tagged Micelles* (Alana Bereck, Fall 2005, Spring 2006, Fall 2006, Spring 2007, Fall 2007, Spring 2008)
- *Marketing Chemical Engineering to Entering Students and Employers* (Catherine Mack, Senior Honors Thesis Project, Fall 2005-Spring 2006).
- *Amino-Acid Alkanethiols Monolayers for Direct Force Measurements* (Zack Martin, SURG Fellow, Summer 2005, Spring 2006).
- *Strand Invasion of PCR Products* (Jessica Melanko, Senior Honors Thesis Project, Fall 2004-Spring 2005)

- *Co-surfactants for Capillary Electrophoresis of DNA using PNA Amphiphiles* (Nicole Gartner, Senior Honors Thesis Project, Fall 2004-Spring 2005)
- *Direct Measurement of Disjoining Pressure for Physically Bonded Perfluoropolyether Lubricant Layers* (Aaron Beaber, NSF REU Researcher, Summer 2004 and Senior Honors Thesis Project, Fall 2004-Spring 2005)
- *Effect of Metal Ions on Crosslinking of Peptides from Mussel Adhesive Protein* (Ann Shchelokova, SURG Fellow, Summer 2004)
- *Thermal Stability of Mismatched PNA/DNA Hybrids* (Lara Kovell, NSF REU Researcher, Summer 2004)
- *Aqueous Two-Phase Polymers for PNA-Assisted DNA Purification* (Michelle O'Malley, Senior Honors Thesis Project, Fall 2003-Spring 2004).
- *Monolayer Phase Behavior of Peptide Amphiphiles* (Nicole Gartner, Chem. Engr. Dept. Fellowship, Summer 2003, Fall 2003)
- *Compatibility of PNA Surfactants with PCR Methods* (Hanish Dayal, NSF REU Researcher, Summer 2003)
- *pH-Controlled Rupture of Liposomes for Oral Delivery of Vaccines* (Beth Newton, Senior Honors Thesis Project, Fall 2002-Spring 2003)
- *Dimensions and CMC Measurements for PNA Surfactants using Pyrene Solubilization* (Michelle O'Malley, Fall 2002, Spring 2003)
- *Multicomponent Adsorption of Alkanethiols for Biosensor Construction* (Priyanka Vaddi, Fall 2002)
- *DNA Adsorption to Liposome-Like Surfaces on Gold* (Diana Yoon, NSF REU Researcher, Summer 2002)
- *Mixed Micelles Hosting PNA Amphiphiles* (Mithun Sheno, Summer 2002)
- *Electrophoretic Mobility of DNA-Liposome Complexes* (Diana Yoon, Fall 2001-Spring 2002)
- *Interfacial Miscibility of PNA Amphiphiles* (David Tucker, SURG Fellow, Summer 2000, Summer 2001)
- *Phase Behavior of Synthetic Lipid-like Compounds for Drug Delivery* (Rohit Rao, Chem. Engr. Dept. Fellowship, Summer 2000)
- *Incorporation of PNA Amphiphiles into Liposome Matrices* (Cindy Echevarria, Fall 2000)

Thesis Committees

- Ph.D. Thesis: Raymond Dagastine, Susan Daly, Nathan Domagalski, Michael Gerber, Jason Hamm, Art Hewig, Warren Hoffmaster, Saturo Izumisawa, Kendell Jillson, , Daniel Kuntz, Abigail Laurent, Jess Nauman, David Newsome, Duc Nguyen, Millicent Ow, Danilo Pozzo, Kevin Sirk, MyHang Truong, Jessica Tucker, Angela Wilcox, (Chem. Engr.), Tanapon Phenrat, Navid Saleh (Civil and Env. Engr.), Ryan Magargle (Elect. Comp. Engr.), Gordon Christopher (Mech. Engr.), Barry Luokkola (Physics), Andrea Benven, Bhaskar Datta, Cong Rao, Peng Zhao (Chemistry)
- Ph.D. Proposal: Nicholas Alvarez, Drew Cunningham, Trishna Saigal (Chem. Engr.), Lindsay Bombalski (Chemistry)

Courses Instructed (Instructor FCE/5.00)

- Spring 2009 06-607 *Physical Chemistry of Colloids and Surfaces*
- Fall 2008 06-100 *Introduction to Chemical Engineering (4.20)*
- Fall 2008 06-608 *Safety in Science and Engineering Practice (4.20)*
- Fall 2007 06-100 *Introduction to Chemical Engineering (4.22)*
- Fall 2007 06-608 *Safety in Science and Engineering Practice (4.06)*
- Fall 2006 06-422 *Chemical Reaction Engineering (4.40)*
- Fall 2006 06-608 *Safety in Science and Engineering Practice (4.00)*
- Fall 2005 06-422 *Chemical Reaction Engineering (4.30)*
- Fall 2005 06-608 *Safety in Science and Engineering Practice (3.90)*
- Spring 2005 06-607 *Physical Chemistry of Colloids and Surfaces (4.64)*
- Fall 2004 06-422 *Chemical Reaction Engineering (3.43)*
- Spring 2004 06-607 *Physical Chemistry of Colloids and Surfaces (4.57)*
- Fall 2003 06-323 *Heat and Mass Transfer (4.54)*
- Spring 2003 06-607 *Physical Chemistry of Colloids and Surfaces (4.50)*
- Fall 2002 06-323 *Heat and Mass Transfer (4.66)*
- Spring 2002 06-607 *Physical Chemistry of Colloids and Surfaces (4.27)*
- Fall 2001 06-323 *Heat and Mass Transfer (4.86)*
- Spring 2001 06-607 *Physical Chemistry of Colloids and Surfaces (4.42)*
- Fall 2000 06-323 *Heat and Mass Transfer (3.58)*
- Spring 2000 06-607 *Physical Chemistry of Colloids and Surfaces (4.05)*