

Vitae

James D. Batteas, FRSC

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APPOINTMENTS

Texas A&M University

D. Wayne Goodman Professor of Chemistry (9/2019 – present)
Professor of Chemistry (9/2012 – 8/2019)
Professor, Materials Science and Engineering (9/2012 – present)
Associate Dean for Research, College of Science (1/20/2017 – 8/31/2020)
Director, TAMU Materials Characterization Facility (9/1/2013 – 8/31/2017)
Associate Professor of Chemistry (8/2005 – 8/2012, tenured, 9/2009)

National Institute of Standards and Technology

Research Chemist, 8/2002 – 8/2005

The City University of New York, College of Staten Island and The Graduate Center

Associate Professor of Chemistry, 2/2002 – 8/2002 (tenured, 2/2002)
Assistant Professor of Chemistry, 9/1996 – 1/2002

EDUCATION

Harvard University, Post-doctoral Fellow, 1995-1996
University of California at Berkeley, Ph.D. Chemistry, 1995
University of Texas at Austin, B.S. Chemistry, 1990

RESEARCH BACKGROUND

Texas A&M University (8/2005 – present)

Research in nanoscale materials and device design, molecular/organic electronics, single molecule devices, molecular forces, nanofabrication via self-assembly and scanning probe lithography, plasmonics, biopolymer materials, plant surfaces, nanotribology, mechanochemistry.

National Institute of Standards and Technology (8/2002 – 8/2005)

Surface and Microanalysis Science Division, Chemical Science and Technology Laboratory
Research in nanoscale materials and device design and molecular electronics metrology, single molecule devices, molecular forces, nanofabrication via self-assembly and probe lithography.

The City University of New York, College of Staten Island and The Graduate Center (8/1996 – 8/2002)

Surface chemistry, applications of atomic force microscopy (AFM) to biopolymer materials, plant surfaces, nanotribology, molecular forces and single bond energetics, colloidal interactions, nanoscale materials and devices, molecular electronics, nanofabrication.

Harvard University (8/1995 – 8/1996)

Investigations of the tribochemistry of lubricant additives on Fe surfaces.
Research Advisor: Professor Cynthia M. Friend

University of California at Berkeley (6/1990 – 8/1995)

Investigations of the fundamental properties of surface chemical bonding and reactivity at defects on metal surfaces.
Thesis Advisor: Professor Gabor A. Somorjai

University of Texas at Austin (8/1986 – 6/1990)

Investigations of the photochemistry and photophysics of chromophore doped polymers.
Research Advisor: Professor Stephen E. Webber

AWARDS and HONORS

Hope College, Department of Chemistry Neckers Lecturer (2022)

University-Level Association of Former Students Distinguished Achievement Award for Teaching (2017)

Presidential Award from the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE) for Service to the STEM Community (2015)

College-Level Association of Former Students Distinguished Achievement Award for Teaching (2013)

Fellow of the Royal Society of Chemistry (elected 2012)

Netsch Instruments Frank Giblin Memorial Award in Polymer Analysis
(Society for Plastics Engineers – Polymer Analysis Division, 2001)

Feliks Gross Endowment Award for Outstanding Scholarship (CUNY Academy, 2001)

Research Corporation Research Innovation Award (1998)

CUNY-CSI Research Released Time Award (1998 & 1999)

CUNY-CSI Junior Faculty Summer Research Fellowship (1997)

Robert A. Welch Research Fellowship (1987-1990)

Robert A. Welch Scholar in Chemistry (1986-1990)

PUBLICATIONS and PATENTS (Google Scholar h-index = 45)

ORCID: 0000-0002-6244-5000

Patents

“Method and Device for Quantitative Control of Force in Mechanochemical Reactions,” J.R. Felts, J.D. Batteas, S. Raghuraman, and T Reyes - US Patent 10,894,243, 2021 – Issued 1-19-21

Articles**In preparation**

Z. Liu, F. Wu, N. Sheehan, N. Argibay, J.F. Curry and J.D. Batteas, “Reactivity of Diazonium Salts with Single and Multilayer MoS₂ on Au(111),” *to be submitted to Langmuir* (2021).

M. Negrito, M. Vazirsereshk, P. Boonpuek, A. Martini, J. Felts and J.D. Batteas, “Visualizing the Hammond Postulate: Using Directed Force to Drive the Reaction of Perfluorophenylazide (PFPA) Self-Assembled Monolayers with Graphene,” *to be submitted to J. Am. Chem. Soc.* (2021).

N. Hawthorne, S. Banerjee, Q. Moore, A.M. Rappe and J.D. Batteas, “Curved, Not Stretched: The Role of Out Plane Mechanical Distortions on the Reactivity of Graphene,” *to be submitted to J. Phys. Chem. C* (2021).

Submitted

F. Wu, Z. Liu, N. Hawthorne, M. Chandross, Q. Moore, N. Argibay, J. Curry and J.D. Batteas, Impact of Substrate Interactions and Layer Thickness on Oxidation of MoS₂ on Au(111), submitted to *ACS Applied Nano Materials* (2021).

2021

M. Negrito, M.B. Elinski, N. Hawthorne, M.P. Pedley, M. Han, M. Sheldon, R.M. Espinosa-Marzal, and J.D. Batteas, "Using Patterned Self-Assembled Monolayers to Tune Graphene-Substrate Interactions," *Langmuir* **37** (2021) 9996-10005.

A. Levine, G. He, G. Bu, P. Ramos, F. Wu, A. Soliman, J. Serrano, D. Pietraru, C. Chan, J. Batteas, M. Kowalczyk, S. Jang, B. Nannenga, M. Sfeir, E. Tsai, and A. Braunschweig, "Efficient Free Triplet Generation Follows Singlet Fission in Diketopyrrolopyrrole Polymorphs with Goldilocks Coupling," *J. Phys. Chem. C* **125** (2021) 12207-12213.

2020

F. Wu, Z. Liu, N. Hawthorne, M. Chandross, Q. Moore, N. Argibay, J. Curry and J.D. Batteas, "Formation of Coherent 1H-1T Heterostructures in Single Layer MoS₂ on Au(111)," *ACS Nano* **14** (2020) 16939-16950.

M. Han, H. Kim, C. Leal, M. Negrito, R.M. Espinosa-Marzal, J.D. Batteas, Insight into the Electrical Double Layer of Ionic Liquids Revealed through Its Temporal Evolution, *Adv. Mater. Interfaces* **7** (2020) 2001313.

J.L. Andrews, P. Stein, D.A. Santos, C.J. Chalker, L.R. De Jesus, R.D. Davidson, M. A. Gross, M. Pharr, M. Meyyappan, J.D. Batteas, B.-X. Xu, and S. Banerjee, Curvature-Induced Modification of Mechano-Electrochemical Coupling and Diffusion Pathways in a Cathode Material, *Matter* **4** (2020) 1754-1773.

L. Douglas, T.E. O'Loughlin, C. Chalker, N. Cool, S. Gupta, J.D. Batteas, and S. Banerjee, Three-Dimensional Inverse Opal TiO₂ Coatings to Enable the Gliding of Viscous Oils, *Energy & Fuels*, **34** (2020) 13606-13613.

F. Wu, N.V.S. Bhupathiraju, A. Brown, Z. Liu, C.M. Drain, and J.D. Batteas, "Mechanical and Electronic Properties of Diacetylene and Poly-Diacetylene Self-Assembled Monolayers on Au(111)," *J. Phys. Chem. C.*, **124** (2020) 4081-4089.

2019

S. Skiles, A. Wan, H. Fu, A.L. Allen, M.B. Elinski, J.D. Batteas and D.E. Bergbreiter, "Solute and Temperature Responsive Smart Membranes Formed by Covalent Layer-by-Layer Assembly," Book Chapter in *Smart Membranes* (2019) pp. 185-201. ed. Liang-Lin Chu, Royal Society of Chemistry ISBN 978-1-78801-243-0

2018

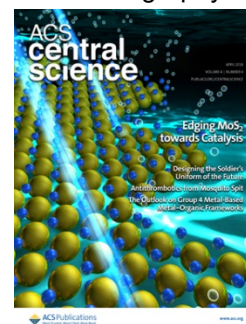
N.V.S.D.K. Bhupathiraju, M. Sayeedi, W. Rizvi, S. Singh, J.D. Batteas and C.M. Drain, "Practical, High-yield Synthesis of Thiol-terminated Diacetylenes for Formation of Conductive Monolayers," *Tetrahedron Lett.* **40** (2018) 3629-3631.

D. Banerjee, C.E. Deckard III, M.B. Elinski, M.L. Buzbee, W. Wei Wang, J.D. Batteas and J.T. Sczepanski, "Plug-and-Play Approach for Preparing Chromatin Containing Site-Specific DNA Modifications: The Influence of Chromatin Structure on Base Excision Repair," *J. Am. Chem. Soc.* **140** (2018) 8260-8267.

J. Gonzales, N.V.S.D.K. Bhupathiraju, D. Hart, M. Yuen, M.P. Sifuentes, B. Samarxhiu, M. Maranan, N. Berisha, J.D. Batteas and C.M. Drain, "One-Pot Synthesis of Four Chlorin Derivatives by a Divergent Ylide," *J. Org. Chem.*, **83** (2018) 6307-6314.

A. Pravitasari, M. Negrito, K. Light, W.-S. Chang, S. Link, M. Sheldon and J.D. Batteas, "Using Particle Lithography to Tailor the Architecture of Au Nanoparticle Plasmonic Nanoring Arrays," *J. Phys. Chem. B* **122** (2018) 730-736.

A. Parija, Y.-H. Choi, Z. Liu, J.L. Andrews, L.R. De Jesus, S.C. Fakra, M. Al-Hashimi, J.D. Batteas, D. Prendergast and S. Banerjee, "Mapping Catalytically Relevant Edge Electronic States of MoS₂," *ACS Cent. Sci.*, **4** (2018) 493-503. (Cover Article)



2017

H. Jin, B. Baek, D. Kim, F. Wu, J.D. Batteas, J. Cheon and D.H. Son, "Effects of Direct Solvent-Quantum Dot Interaction on the Optical Properties of Colloidal Monolayer WS₂ Quantum Dots," *Nano Lett.* **17** (2017) 7471-7477.

A. Pawlicki, A. Bilan, M. Jurow, C.M. Drain and J.D. Batteas, "The Influence of Nearest-Neighbor Interactions and Assembly Dynamics on the Transport Properties of Porphyrin Supramolecular Assemblies on Au (111)," *Faraday Discussions* **204** (2017) 349-366.

C.J. Chalker, H. An, J.A. Zavala, A. Parija, S. Banerjee, J.L. Lutkenhaus and J.D. Batteas, "Fabrication and Electrochemical Performance of Structured Mesoscale Open Shell V₂O₅ Networks," *Langmuir* **33** (2017) 5975-5981.

S.R. Kwon, M.B. Elinski, J.D. Batteas and J.L. Lutkenhaus, "Robust and Flexible Aramid Nanofiber/Graphene Layer-by-Layer Electrodes," *ACS Appl. Mater. Interfaces* **9** (2017) 17125-17135.

S. Raghuraman, M. B. Elinski, J. D. Batteas and J. R. Felts. "Driving Surface Chemistry at the Nanometer Scale Using Localized Heat and Stress," *Nano Lett.* **17** (2017) 2111-2117.

M.B. Elinski, Z. Liu, J.C. Spear and J.D. Batteas, "2D or not 2D? The impact of Nanoscale Roughness and Substrate Interactions on the Tribological Properties of Graphene and MoS₂," *J. of Phys. D: Appl. Phys.* **50** (2017)103003.

M.B. Elinski, B.D. Menard, Z. Liu and J.D. Batteas, "Adhesion and Friction at Graphene/Self-Assembled Monolayer Interfaces Investigated by Atomic Force Microscopy," *J. Phys. Chem. C* **121** (2017) 5635-5641.

2016

C. Xu, A. Wan, X. Gong, N.V.S.D.K. Bhupathiraju, J.D. Batteas and C.M. Drain, *J. of Porphyrins and Phthalocyanines* **20** (2016) 439-443.

A. Pawlicki, E. Avery, M. Jurow, B. Ewers, A. Vilan, C.M. Drain and J.D. Batteas, "Studies of the Structure and Phase Transitions of Nano-confined Petanedithiol and its Applications in Directing Hierarchical Molecular Assemblies on Au(111)," *J. of Physics: Cond. Matter* **28** (2016) 094013.

N.V.S.D.K. Bhupathiraju, W. Rizvi, J.D. Batteas and C.M. Drain, "Fluorinated Porphyrinoids as Efficient Platforms for New Photonic Materials, Sensor and Therapeutics," *Organic and Biomolecular Chemistry*, **14** (2016) 389-408. (Cover Article)

**2015**

J.C. Spear, J.P. Custer and J.D. Batteas, "Frictional Properties of Graphene on Silica Surfaces with Nanoscale Roughness," *Tribology and Lubrication Technology* **71** (2015) 40-43.

A.E. Schuckman, B.W. Ewers, L.H. Yu, J.P.C. Tomé, L.M. Pérez, C.M. Drain, J.G. Kushmerick, and J.D. Batteas, "Unveiling how Nearest-Neighbor Interactions Alter Charge Transport Mechanisms in Molecular Assemblies of Porphyrins on Surfaces," *J. Phys. Chem. C* **119** (2015) 13569-13579.

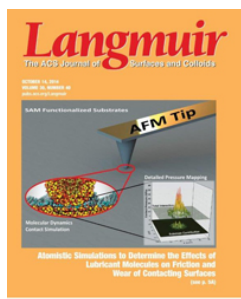
J.C. Spear, J.P. Custer and J.D. Batteas, "The Influence of Nanoscale Roughness and Substrate Chemistry on the Frictional Properties of Single and Few Layer Graphene," *Nanoscale* **7** (2015) 10021-10029.

J.C. Spear, B.W. Ewers and J.D. Batteas, "2D-Nanomaterials for Controlling Friction and Wear at Interfaces," *Nano Today* **10** (2015) 301-314.

2014

Q. Liu, A. Díaz, A. Prosvirin, Z. Luo and J.D. Batteas, "Shape-Controlled Synthesis of Nanopyramids and Nanoprisms of Nickel Sulfide (Ni₃S₄)," *Nanoscale* **6** (2014) 8935-8942.

B.W. Ewers and J.D. Batteas, "The Role of Substrate Interactions in the Modification of Surface Forces by Self-assembled Monolayers," *RSC Advances* **4** (2014) 16803-16812.

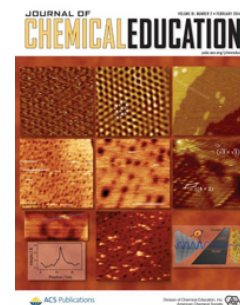


B.W. Ewers and J.D. Batteas, "Utilizing Atomistic Simulations to Map Pressure Distributions and Contact Areas in Molecular Adlayers within Nanoscale Surface-Asperity Junctions: A Demonstration with Octadecylsilane Functionalized Silica Interfaces," *Langmuir* **30** (2014) 11897-11905. (Cover Article)

B.W. Ewers, A.E. Schuckman and J.D. Batteas, "Why Did the Electron Cross the Road? A Scanning Tunneling Microscopy (STM) Study of Molecular Conductance for the Physical Chemistry Lab," *J. Chem. Educ.* **91** (2014) 283-290. (Cover Article)

2013

Y. Park, A. Pravitisari, J. Raymond, J.D. Batteas and D.-H. Son, "Suppression of Quenching in Plasmon-Enhanced Luminescence via Rapid Intra-particle Energy Transfer in Doped Quantum Dots," submitted to *ACS Nano* **7** (2013) 10544-10551.

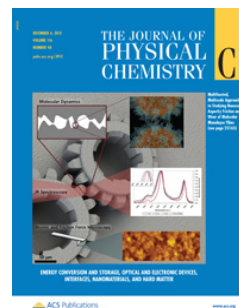


A. Diaz, B.M. Mosby, V.I. Bakhmutov, A.A. Marti, J.D. Batteas, and A. Clearfield, "Self-Assembled Monolayers Based Upon a Zirconium Phosphate Platform," *Chem. Mater.* **25** (2013) 723-728.

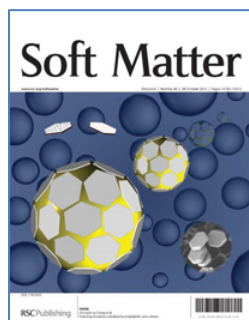
V. Saxena, A. Diaz, A. Clearfield, J.D. Batteas, and M.D. Hussain, "Zirconium Phosphate Nanoplatelets: A Biocompatible Nanomaterial for Drug Delivery to Cancer," *Nanoscale* **5** (2013) 2328-2336.

2012

B.W. Ewers and J.D. Batteas, "Impact of Nanoscale Roughness on Alkylsilane Self-Assembled Monolayer Formation and Structure Examined by Molecular Dynamics Simulation," *J. Phys. Chem. C* **116** (2012), 25165-25177. *Invited Feature Article – Cover Article*



A. Mijalis, H. Fu, Hui, C. Agosto, J.D. Batteas and D.E. Bergbreiter "Reversible Changes of Solution pH Resulting from Changes in Thermoresponsive Polymer Solubility," *J. Am. Chem. Soc.* **134** (2012) 7378-7383.



A.F. Mejia, A. Diaz, S. Pullela, Y.-W. Chang, M. Simonetty, C. Carpenter, J.D. Batteas, M.S. Mannan, A. Clearfield, and Z. Cheng , "Pickering Emulsions Stabilized by Amphiphilic Nano-sheets," *Soft Matter* **8** (2012) 1245-10253. (Cover Article)

A. Allen, K. Tan, H. Fu, J.D. Batteas and D.E. Bergbreiter, "Solute- and Temperature-Responsive "Smart" Grafts and Supported-Membranes Formed by Covalent Layer-by-Layer Assembly," *Langmuir* **28** (2012) 5237-5242.

A. Díaz, V. Saxena, J. González, A. David, B. Casañas, C. Carpenter, J.D. Batteas, J.L. Colón, A. Clearfield and M.D. Hussain, "Zirconium Phosphate Nano-platelets: A Novel Platform for Drug Delivery in Cancer Therapy," *Chem. Comm.* **48** (2012) 1754-1756.

2011

A. Aggarwal, M. Qureshy, J. Johnson, J.D. Batteas, C. M. Drain, D. Samaroo, "Responsive Porphyrinoid Nanoparticles: Development and Applications," *J. Porph. and Phthal.* **15** (2011) 338-349.

S. Singh, A. Aggarwal, C. Farley, B.A. Hageman, J.D. Batteas and C.M. Drain, Hierarchical Organization of a Robust Porphyrin Cage Self-Assembled by Hydrogen Bonds," *Chem. Comm.* **47** (2011) 7134-7136.

X. Hong, Z. Luo, and JD. Batteas, "Enhanced Visible Light Absorption and Dopant Distribution of I- TiO₂ Nanoparticles Synthesized by a New Facile Two-Step Hydrothermal Method," *Journal Solid State Chemistry* **184** (2011) 2244-2249.

2010

R.L. Jones, B.L. Harrod and J.D. Batteas, "Intercalation of 3-phenyl-1-propanol into OTS SAMs on Silica Nanoasperities to Create Self-Repairing Films for MEMS Lubrication," *Langmuir* **26** (2010) 16355-16361.

K. Cho, W.D. Kerber, S.-R. Lee, A. Wan, J.D. Batteas and D.P. Goldberg, "Preparation, Size Control, Surface Deposition, and Catalytic Reactivity of Hydrophobic Corrolazine Nanoparticles in an Aqueous Environment," *Inorg. Chem.* **49** (2010) 8465-8473.

M. Jurow, A.E. Schuckman, J.D. Batteas and C.M. Drain, "Porphyrins as Molecular Electronic Components of Functional Devices," *Coord. Chem. Rev.* **254** (2010) 2297-2310.

Y.-H. Chan, J. Chen, Q.-S. Liu, S.E. Wark, D.-H. Son and J.D. Batteas, "Ultrasensitive Copper(II) Detection Using Plasmon-Enhanced and Photo-Brightened Luminescence of CdSe Quantum Dots," *Anal. Chem.* **82** (2010) 3671-3678.

H. Fu, D. Policarpio, J.D. Batteas and D.E. Bergbreiter, "Redox-Controlled 'Smart' Polyacrylamide Solubility," *Polym. Chem.* **1** (2010) 631-633.

H. Fu, X. Hong, A. Wan, J.D. Batteas and D.E. Bergbreiter, "Parallel Effects of Cations on PNIPAM Graft Wettability and PNIPAM Solubility," *ACS Appl. Mater. Interfaces* **2** (2010) 452-458.

2009

J. Chen, Y.-H. Chan, T. Yang, S.E. Wark, D.-H. Son and J.D. Batteas, "Spatially Selective Optical Tuning of Quantum Dot Thin Film Luminescence," *J. Am. Chem. Soc.* **131** (2009) 18204-18205.

T. Isaacson, D. Kosma, A.J. Matas, G.J. Buda, Y. He, B. Yu, A. Pravitasari, J.D. Batteas, R.E. Stark, M.A. Jenks and J.K.C. Rose, "Cutin Deficiency in the Tomato Fruit Cuticle Consistently Affects Resistance to Microbial Infection and Biomechanical properties, but not Transpirational Water Loss," *The Plant Journal* **60** (2009) 363-377. (Cover Article)



Y.-H. Chan, J. Chen, S.E. Wark, S.L. Skiles, D.-H. Son and J.D. Batteas, "Using Patterned Arrays of Metal Nanoparticles to Probe Plasmon Enhanced Luminescence of CdSe Quantum Dots," *ACS Nano* **3** (2009) 1735-1744.

Q. Liu, Z. Yan, N. L. Henderson, J.C. Bauer, D.W. Goodman, J.D. Batteas and R.E. Schaak, "Synthesis of CuPt Nanorod Catalysts with Tunable Lengths," *J. Am. Chem. Soc.* **131** (2009) 5720-5721.

R.L. Jones, N.C. Pearsall and J.D. Batteas, "Disorder in Alkylsilane Monolayers Assembled on Surfaces with Nanoscopic Curvature," *J. Phys. Chem. C.* **113** (2009) 4507-4514.

J. Chen, W.-S. Liao, X. Chen, T. Yang, S.E. Wark, D.H. Son, J.D. Batteas, and P.S. Cremer, "Evaporation-Induced Assembly of Quantum Dots into Nanorings," *ACS Nano* **3** (2009) 173-180.

K.-S. Liao, H. Fu, A. Wan, J.D. Batteas and D.E. Bergbreiter, "Designing Surfaces with Wettability That Varies in Response to Solute Identity and Concentration," *Langmuir* **25** (2009) 26-28.

2008

K.-S. Liao, A. Wan, J.D. Batteas and D.E. Bergbreiter "Superhydrophobic Surfaces Formed Using Layer-by-Layer Self-Assembly with Aminated MWNTs," *Langmuir* **24** (2008) 4245-4253.

C. Xu, R.L. Jones and J.D. Batteas, "Dynamic Variations in Adhesion of Self-assembled Monolayers on Nanoasperities Probed by Atomic Force Microscopy," *Scanning* **30** (2008) 106-117.

Y.-H. Chan, A.E. Schuckman, L.M. Pérez, M. Vinodu, C.M. Drain and J.D. Batteas, "Synthesis and Characterization of Thiol Tethered Tri-pyridyl Porphyrin on Au(111)," *J. Phys. Chem. C.* **112** (2008) 610-618.

2007

M. Kadalbajoo, H. Suda, A. Opdahl, C.A. Kitchens, J. Garno, J. D. Batteas, M.J. Tarlov, and P. DeShong, "Oligosaccharide-Based Self-Assembled Monolayers (SAM): Evidence for Organized Monolayers and Bilayers," *Langmuir* **23** (2007) 700-707.

J.C. Garno, C.D. Zangmeister, and J.D. Batteas, "Directed Electroless Growth of Metal Nanostructures on Patterned Self-Assembled Monolayers," *Langmuir* **23** (2007) 7874-7879.

C.M. Mahoney, A.J. Fahey, G. Gillen, C. Xu, and J.D. Batteas, "Temperature-Controlled Depth Profiling in Poly(methylmethacrylate) (PMMA) using Cluster Secondary Ion Mass Spectrometry (SIMS): 2. An Investigation of Sputter-induced topography, chemical damage and depolymerization effects" *Anal. Chem.* **79** (2007) 837-845.

L.C. Teague, S. Banerjee, S.S. Wong, C.A. Richter, B. Varughese and J.D. Batteas, "Effects of Ozonolysis and Subsequent Growth of Quantum Dots on the Electrical Properties of Freestanding Single-Walled Carbon Nanotube Films," *Chem. Phys. Lett.* **442** (2007) 354-359.

2006

J.C. Garno, C. Xu, J.D. Batteas and C.M. Drain, "Designing Supramolecular Porphyrin Arrays for Surface Assembly and Patterning of Optoelectronic Materials," ACS Symposium Series 928, pp. 168-183, Washington, DC **2006**.

J.D. Batteas and J.C. Garno, "Nanofabrication with Self-Assembled Monolayers by Scanned Probe Lithography," Applied Scanning Probe Methods Volume IV, B. Bhushan (ed.), Springer-Verlag, pp. 105 – 136, Heidelberg, Germany, **2006**.

C. Xu, T. Wu, J.D. Batteas, C.M. Drain, K.L. Beers and M.J. Fasolka, "Surface-grafted block copolymer gradients: Effect of block length on solvent response," *Appl. Surf. Sci.* **252** (2006) 2529-2534.

L.B. Picraux, C.D. Zangmeister, and J.D. Batteas, "Preparation and Structure of Low-density, Flat-Lying Decanethiol Monolayer from the Densely-packed, Upright Monolayer on Gold," *Langmuir* **22** (2006) 174-180.

J.M. Helt and J.D. Batteas, "Implications of the Contact Radius to Line-Step (CRLS) Ratio in AFM for Nanotribology Measurements," *Langmuir* **22** (2006) 6130-6141.

C. Xu, S. E. Barnes, T. Wu, D. A. Fischer, D. M. DeLongchamp, J. D. Batteas, K. L. Beers "Generation of Solution and Surface Gradients via Microfluidic Confinement: Fabrication of a Statistical Copolymer Composition Gradient" *Adv. Mater.* **18** (2006) 1427-1430.

C. Xu, T. Wu, J. D. Batteas, C. M. Drain, K. L. Beers, "Block Copolymer Brush Gradients, Combinatorial Platforms to Study Block Copolymer brush properties" *Macromolecules* **39** (2006) 3359-3364.

G. Gillen, J. Batteas, C.A. Michaels, P. Chi, J. Small, E. Windsor, A. Fahey, J. Verkouteren and K.J. Kim, "Depth profiling using C60+SIMS - Deposition and topography development during bombardment of silicon," *Appl. Surf. Sci.* **252** (2006) 6521-6525.

C.M. Mahoney, A.J. Fahey, G. Gillen, C. Xu, and J.D. Batteas, "Temperature-Controlled Depth Profiling in Poly(methylmethacrylate) (PMMA) using Cluster Secondary Ion Mass Spectrometry (SIMS)," *Appl. Surf. Sci.* **252** (2006) 6502-6505.

R.W. Carpick, J.D. Batteas and Maarten P. de Boer, "Scanning Probe Studies of Nano-Scale Adhesion Between Solids in the Presence of Liquids and Monolayer Films," book chapter, in *Springer Handbook of Nanotechnology 2nd edition*, B. Bhushan (ed.), Springer-Verlag, Heidelberg, Germany, 951-979, **2006**.

2005

J.M. Helt and J.D. Batteas, "Wear of Mica in Aqueous Solutions: Direct Observation of Defect Nucleation by AFM," *Langmuir* **21** (2005) 633-639.

C. Xu, T. Wu, C.M. Drain, J.D. Batteas and K.L. Beers, "Microchannel Confined Surface Initiated Polymerization," *Macromolecules* **38** (2005) 6-8.

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P.K. Catterjee, K. Kamioka, J.D. Batteas, and S.E. Webber, "Triplet-State Electron Transfer in Poly(methacrylic acid) with Covalently Bound Phenanthrene and Naphthalene," *J. Phys. Chem.* **95** (1991) 960-965.

J.D. Batteas, A. Harriman, Y. Kanda, N. Mataga, and A.K. Nowak, "Photoinduced Charge Separation in a Porphyrin-Tetraviologin Supramolecular Array," *J. Am. Chem. Soc.* **112** (1990) 126-133.

PRESENTATIONS**Upcoming**

"Mechanochemical Reactions on 2D Materials," Pacifichem, December 16-21, 2021.

"TAMU Youth Adventure Program Camps in Chemistry," Pacifichem, December 16-21, 2021.

"Using the Force in Chemistry: The Hidden World of Mechanochemistry," The 2022 James and Jeanette Neckers Lecturer, Hope College, March 10, 2022 – Public Lecture

"Directing Chemical Reactions with Force," The 2022 James and Jeanette Neckers Lecturer, Hope College, March 11, 2022 – Research Lecture

"Tuning the Frictional Properties of Graphene by Substrate Stapling," 7th World Tribology Congress, Lyon France, July 10 – 15, 2022.

"Influence of Substrate and Film Thickness on the Oxidation of MoS₂ on Au(111)," 7th World Tribology Congress, Lyon France, July 10 – 15, 2022.

Completed

"Friction and Energy Dissipation in 2D Materials," Web Seminar Series on Tribology, ETH-Zürich, June 2, 2020

"Architected Heterostructures of Porphyrins for Optoelectronic Devices," 2nd funCOS International Workshop, Erlangen, Germany, November 17-19, 2019.

"Friction and Mechanochemical Reactivity of 2D Nanomaterials," 257th National American Chemical Society Meeting, August 25-29, 2019.

"Studies of Friction and Mechanically Driven Chemical Reactivity of 2D Nanomaterials," UT – Austin, March 27, 2019.

"Studies of Friction and Mechanochemical Reactivity of 2D Nanomaterials," Exxon-Mobil, December 14, 2018.

"Applications of 2D Nanomaterials for Controlling Friction," STLE Tribology Frontiers, All Stars of Tribology PI Poster Session, October 29, 2018.

"Studies of Friction, Energy Dissipation and Chemical Reactivity of 2D Nanomaterials," 256th National American Chemical Society Meeting, August 19-23, 2018.

"Reducing the Barrier: Driving Chemical Reactions on Surfaces with Force," Gordon Research Conference on Tribology, June 24-29, 2018.

"Tribochemistry," part of the Nanotribology short course at the 2018 STLE Annual Meeting in Minneapolis, MN, May 20-24, 2018.

"Controlling Friction, Energy Dissipation and Chemical Reactivity in 2D Nanomaterials," APS/CNM Users Meeting, Argonne National Labs, May 7-9, 2018.

"Probing the Load/Strain Dependent Reaction of Perfluorophenylazide (PFPA) with Graphene," 255th National American Chemical Society Meeting, March 18-22, 2018.

"2D or not 2D? Tribology, Energy and 2D Nanomaterials," Hunter College, March 16, 2018.

"2D or not 2D? Tribology, Energy and 2D Nanomaterials," CUNY-Advanced Science Research Center, March 15, 2018.

"2D or not 2D? Tribology, Energy and 2D Nanomaterials," St. Edwards University, February 16, 2018.

"2D or not 2D? The Impact of Nanoscale Roughness on Adhesion and Friction of Graphene and MoS₂," 45th Conference on the Physical Chemistry of Surfaces and Interfaces, January 14-18, 2018.

"Controlling the Self-Assembly and Optoelectronic Properties of Porphyrin Nanostructures," 45th Conference on the Physical Chemistry of Surfaces and Interfaces, January 14-18, 2018.

"2D or not 2D? The Impact of Nanoscale Roughness on Adhesion and Friction of Graphene and MoS₂," Sandia National Labs, October 19, 2017.

"Studies of the Dynamic Tribological Properties of 2D Nanomaterials," 6th World Tribology Congress, Beijing, China, September 18-22, 2017.

"Formation of Au Nanoring Arrays via Particle Lithography for Applications in Plasmonics," 254th National American Chemical Society Meeting, August 20-24, 2017.

"Self-assembly and Photophysical Properties of Porphyrin Nanofibers," 254th National American Chemical Society Meeting, August 20-24, 2017.

"The Influence of Nearest-Neighbor Interactions and Assembly Dynamics on the Transport Properties of Porphyrin Supramolecular Assemblies on Au (111)," Faraday Discussion on Complex Molecular Surfaces and Interfaces, July 24-26, 2017.

"Studies of the Dynamic Frictional Properties of 2D Nanomaterials," 253rd National American Chemical Society Meeting, April 2-6, 2017.

"Tuning Charge Transport in Supramolecular Assemblies of Porphyrins on Au," 253rd National American Chemical Society Meeting, April 2-6, 2017.

"2D or not 2D? The Impact of Nanoscale Roughness on Adhesion and Friction of Graphene," 253rd National American Chemical Society Meeting, April 2-6, 2017.

"Controlling Charge Transport Mechanisms by Tuning the Architectures of Supramolecular Assemblies," University of Strathclyde, Scotland, December 9, 2016.

"Controlling Charge Transport Mechanisms by Tuning the Architectures of Supramolecular Assemblies, Texas State University," October 17, 2016.

"2D or not 2D? Understanding How a Single Atomic Layer of Carbon Changes Friction," Ursinus College, September 23, 2016.

"2D or not 2D? Understanding How a Single Atomic Layer of Carbon Changes Friction," Dow Chemical, Collegeville, PA September 22, 2016.

"Studies of the Dynamic Tribological Properties of Graphene on Rough Surfaces," 71st Society of Tribologists and Lubrication Engineers Annual Meeting and Exhibition, May 15-19, 2016.

"Modulating Charge Transport Mechanisms by Tuning the Architectures of Supramolecular Assemblies," 251st National American Chemical Society Meeting, March 13-17, 2016.

"Pushing Electrons Around: Tuning Charge Transport Mechanisms Through Controlled Supramolecular Assembly," 43rd Conference on Physics and Chemistry of Surfaces and Interfaces, January 17-21, 2016

"Modulating Charge Transport Mechanisms by Tuning the Architectures of Supramolecular Assemblies," Pacifichem 2015, December 16-21, 2015.

"Studies on the Use of Atomically Thin Films for Controlling Friction and Adhesion at Interfaces," 62nd Annual American Vacuum Society International Symposium and Exhibition (AVS 2015), October 18-23, 2015.

"2D or not 2D? Understanding How a Single Atomic Layer of Carbon Changes Friction," Hope College, October 9, 2015.

"2D or not 2D? Understanding How a Single Atomic Layer of Carbon Changes Friction," Calvin College, October 8, 2015.

"Nanotribology, Where Chemistry and Mechanics Meet," 70th Society of Tribologists and Lubrication Engineers Annual Meeting and Exhibition, May 17-21, 2015.

"Mapping Pressure Distributions in Molecular Adlayers with Nanoscale Asperity-Asperity Contacts," 70th Society of Tribologists and Lubrication Engineers Annual Meeting and Exhibition, May 17-21, 2015.

"Friction Modification of Surfaces Using Graphene and Graphene Composite Materials," International Conference on Metallurgical Coatings and Thin Films, April 20-24, 2015.

"2D or no 2D? The Impact of Nanoscale Roughness and Substrate Interactions on the Tribological Properties of Graphene," Argonne National Labs CNM Workshop: Exploring the Flatland, May 12, 2015.

"Studies of Stimuli Responsive Polymer Composite Grafts by Colloidal Probe Microscopy," 249th ACS National Meeting of the American Chemical Society, March 24, 2015.

"The Influence of Molecular Connectivity and Nearest-Neighbor Interactions on the Charge Transport Properties of Porphyrin Assemblies on Surfaces," University of New Orleans, February 27, 2015.

"Influence of Molecular Connectivity and Nearest Neighbor Interactions on the Charge Transport Properties of Porphyrin Assemblies on Au Surfaces," Workshop on Light-Driven Processes for Bio-Inspired Materials, Rice University, December 13-15, 2014.

"REU Activities in Materials Chemistry at Texas A&M University," 2014 Materials Research Society Fall Meeting, November 30 – December 3, 2014.

"Research Experiences for Undergraduates at TAMU," Council on Undergraduate Research, Research Experiences for Undergraduates Symposium, October 26-28, 2014.

"Controlling Friction on the Nanoscale," Muhlenberg College, October 17, 2014.

"Tuning the Frictional Properties of Surfaces with Nanoscale Roughness Using SAMs and Graphene-SAM Composites," 248th ACS National Meeting of the American Chemical Society, August 10-14, 2014.

"Friction and adhesion in ultrathin films on surfaces with nanoscale roughness". Gordon Research Conference - Tribology, July 20-25, 2014.

"Nanotribological studies of silane and silane/graphene composites thin films on surfaces with nanoscale roughness," Silanes Workshop - ETH- Zurich, July 8-9, 2014.

"Tribological Studies of Friction and Adhesion in Nanoscaled Asperity-Asperity Contacts," Society of Tribologists and Lubrication Engineers (STLE), May 18-22, 2014.

"Tribological Studies of Friction and Adhesion in Nanoscaled Asperity-Asperity Contacts," BP-RSC Conference on Tribology, Wuhan and Shanghai, China, November 19-22, 2013. (Given by video)

"Friction and Adhesion in Nanoscaled Asperity-Asperity Contacts – Behavior of Molecular Adlayers and Graphene as Friction Modifiers on Rough Surfaces," University of Pennsylvania, October 10, 2013.

"Examining the Role of Load Dependent Bond Strain on Atomic Scale Defect Nucleation in Nanoscopic Contacts," 5th World Tribology Congress, Turino, Italy, September 8-13, 2013

"Studies of Charge Transport in Tunable Molecular Assemblies on Surfaces," 245th National American Chemical Society Meeting, April 8, 2013.

"When Surfaces get Rough: Tribochemistry of Nanoscale Asperity-Asperity Contacts," Texas Tech University, March 29, 2013.

"Studies of Charge Transport in Confined Molecular Assemblies," ETH Zürich, March 5, 2013.

"Tuning Charge Transport in Porphyrin Assemblies on Metal and Graphene Surfaces" 68th Southwest Regional ACS Meeting," November 4-7, 2012.

"Assembling on a Curve: Molecular Assemblies on Nanoasperities and the Impact of Surface curvature on Monolayer Structure and Friction," 244th National Meeting of the American Chemical Society, August 19 – 23, 2012.

"Stimuli-responsive Surfaces: Hard, Soft or Indifferent Mechanics," Gordon Research Conference on Tribology, July 8-13, 2012

"When Surfaces Get Rough: Tribochemistry of Nanoscale Asperity-Asperity Contacts," Texas State University, April 9, 2012.

"Studies of Friction and Wear in Nanoscopic Contacts Modified by Mixed Monolayer Films," Engineering Conferences International, Advances in Lubrication: Linking Molecular, Meso, and Machine Scales, Puntarenas, Costa Rica, January 8-13, 2012.

"When Surfaces Get Rough: Friction and Adhesion at Nanoscale Asperity-Asperity Contacts," Portland State University, November 18, 2011.

"Electron Transport in Single Molecules and Ensembles of Porphyrins on Au Surfaces, Southwest Regional ACS Meeting," Symposium Honoring Paul Barbara, November 11, 2011.

"Studies of Chemical Changes in Nanoscopic Contacts: Combined TERS and AFM Measurements," FACSS 2011, October 4-6, 2011.

"Tales from the Nanoscale: Fabrication and Tuning of Quantum Dot Assemblies on Surfaces for Optoelectronics and Sensing," Cameron University, September 22, 2011.

"Studies of Chemical Changes in Nanoscopic Contacts: Combined TERS and AFM Measurements," Northwest Regional ACS Meeting, June 29 – 29, 2011.

"Tuning the Assembly of Porphyrin Nanowires," 242nd National Meeting of the American Chemical Society, August 28 – September 1, 2011.

"Studies of Conduction in Confined Molecular Assemblies," Johns Hopkins University, February 24, 2011.

"Studies of Conduction in Confined Molecular Assemblies," University of Delaware, February 25, 2011.

"Coming to America, Graduate School Opportunities for International Students in the US," 241st National Meeting of the American Chemical Society, March 26 – 30, 2011.

"Plasmon Enhanced Photoluminescence of QD Arrays," PacifiChem 2010, December 15-20, 2010.

"Tales for the Nanoscale: Conduction in Confined Porphyrin Assemblies," Dickinson College, November 19, 2010.

"Tales from the Nanoscale: Patterning of QD Arrays for Chemical Sensing and Display Applications," Appalachian State University, October 19, 2010.

"Creating Nanoscale Assemblies of QDs on Surfaces for Chemical Sensing and Display Applications," Xavier University, September 16, 2010.

"AFM and IR Studies of Molecular Assemblies on Silica Nanoasparties for Friction Modification," Society of Tribologists and Lubrication Engineers, May 16-20, 2010.

"Plasmon Enhanced Photoluminescence and Optical Tuning of QD Assemblies," University of Texas-Austin, May 7, 2010.

"The Graduate School Process," 239th National Meeting of the American Chemical Society, March, 21-25 2010.

"Fabrication and Optical Tuning of Nanoscale Quantum Dot Assemblies for Light Harvesting and Chemical Sensing," Louisiana State University, February 3, 2010.

"Creating well-defined molecular and colloidal assemblies with scanning probe techniques," MOEMS-MEMS Photonics West SPIE Conference, January 23-28, 2010.

"Fabrication and Optical Tuning of Nanoscale Quantum Dot Assemblies on Surfaces," Southeastern Louisiana University, December 4, 2009.

"Surface and Interfacial Studies of Plant Protective Membranes," Innovation Seminar, BASF, Cary, NC, November 20, 2009.

"Patterned Assemblies of Quantum Dot Arrays for Energy Transfer and Sensing Applications," Rice University, October 28, 2009.

"Patterned Assemblies of Quantum Dot Arrays for Energy Transfer and Sensing Applications," University of Minnesota-Duluth, September 18, 2009.

"Direct on chip synthesis of QD arrays for light harvesting and sensing applications," 238th National Meeting of the American Chemical Society, August, 16-20 2009.

"Patterned Assemblies of Quantum Dot Arrays for Energy Transfer and Sensing Applications," University of Texas at Dallas, April 3, 2009.

"Surface and Interfacial Studies of Plant Protective Membranes," 238th National Meeting of the American Chemical Society, March 22-26, 2009.

"Conduction in Confined Molecular Assemblies," 237th National Meeting of the American Chemical Society, March 22-26, 2009.

"Surface and Interfacial Studies of Plant Protective Membranes," Texas A&M University, February 11, 2009.

"Patterning Nanoscale Test Arrays for Studies of Confined Molecular Structures," SPIE International Symposium on MOEMS-MEMS, January 24-29, 2009.

"Soft Lithographic Approaches to Patterning of Optoelectronics," 2008 Fall MRS Meeting, December 1- 5, 2008.

"Conduction in Confined Molecular Assemblies," Texas A&M University, Physics Department Condensed Matter Seminars, November 5, 2008.

"Photopatterning of QD Arrays for Sensing and Optoelectronics," Smith College, September 18, 2008.

"Modulating Friction, Adhesion and Wettability of Rough Surfaces" Gordon Research Conference on Tribology, July 5 – 11, 2008.

"Probing Molecular Conduction in Confined Nanoscopic Geometries," Hunter College, June 4, 2008.

"Charge Transport in Porphyrin Assemblies on Au," Columbia University, June 3, 2008.

"Molecular Conduction in Confined Geometries," Central Michigan University, April 28, 2008.

"Defect Nucleation in Nanoscopic Contacts," 235th National American Chemical Society Meeting, April 10, 2008.

"Chemistry in Confined Geometries," Priestly Medal Award Symposium, American Chemical Society Meeting, April 6, 2008.

"So you think you want to go to graduate school?" Grad School Reality Check, 235th National American Chemical Society Meeting, April 5, 2008.

"Probing Molecular Assembly and Molecular Conduction in Confined Geometries," University of California at Davis, March 28, 2008.

"Molecular Conduction in Confined Nanoscopic Geometries," University of California at Berkeley, March 27, 2008.

"Probing Molecular Assembly and Adhesion in Nanoscale Asperity-Asperity Contacts," Materials Research Society, San Francisco, CA, March 24-26, 2008.

"Molecular Conduction in Confined Geometries," University of South Carolina, February 25, 2008.

"Defect Nucleation and Wear in Nanoscopic Contacts," Southwest Regional Meeting of the ACS, November 5, 2007.

"Surface and Interfacial Studies of Plant Biopolymers," Annual Technical Conference of the Society of Plastic Engineers, Cincinnati, OH, May 6-10, 2007.

"Tales from the Nanoscale: Organizing and Characterizing Molecular Assemblies for Nanodevices," Texas Lutheran University, October 26, 2007.

“Soft Lithographic Approaches to Patterning of Metal Nanostructures on Surfaces,” 234th National ACS Meeting & Exposition, Boston, MA, August 19-23, 2007.

“Fabrication of Nanoscale Test Arrays for Molecule Conduction,” NanoSummit 2007, Texas A&M University, August 8, 2007.

“Fabrication of Nanoscale Test Arrays for Molecule Conduction,” Molecular Conduction Workshop, Purdue University, July 19, 2007.

“Tales from the Nanoscale: Organizing and Characterizing Molecular Assemblies for Nanodevices” Angelo State University, April 3, 2007.

“The Role of Interfacial Water in the Tribochemical Wear of Mica and Etching of GaAs Surfaces,” 232nd, National American Chemical Society Meeting, September 12, 2006.

“Surface Chemistry in Confined Geometries,” 232nd, National American Chemical Society Meeting, September 13, 2006.

“Patterning and Chemical Assembly on GaAs Surfaces for Electronics and Photonics Applications,” Telluride Workshop on Functional Modification of Semiconductor Surfaces, July 30 – August 5, 2006.

“Defect Nucleation and Wear on Surfaces,” Gordon Research Conference on Tribology, June 18-23, 2006.

“Nanopatterning of Surfaces,” ANTEC 2006 New Technology Forum, May 7-10, 2006.

“SPM Patterning of Nanoscale Metallic Junctions,” SPIE Defense and Security 2006 Symposium, April 20, 2006.

“Self-Organizing Nanoscale Materials and Devices for Molecular/Organic Electronics,” Pacifichem 2005, December 15-20, 2005.

“A Combined Theory and STM Investigation of Charge Transport at Metal-Molecule Junctions,” 229th National American Chemical Society Meeting, March 11-16, 2005.

“Patterning of Nanoscale Metallic Structures Using Automated Scanned Probe Lithography,” 2004 MRS Fall Meeting, November 29 – December 3, 2004.

“Charge Transport in Alkanethiols and OPE’s probed by STM,” 2004 MRS Fall Meeting, November 29 – December 3, 2004.

“Interfacing with the Nanoscale: Approaches for Organizing Nanoscale Organic and Metallic Structures on Surfaces,” Exxon/Mobil Corporate Research Labs, November 4, 2004.

“Interfacing with the Nanoscale: Approaches for Organizing Nanoscale Organic and Metallic Structures on Surfaces,” Materials Sciences Division, Brookhaven National Labs, October 28, 2004.

“Charge Transport in Alkanethiols and Molecular Wires,” Symposium on Nanoscience and Nanotechnology, 227th National American Chemical Society Meeting, March 28 – April 1, 2004.

“Synthesis and Transfer of Materials to and from Polymers (STOMP): A New Imprinting Method for Fabrication of Micro- to Nanoscale Structures on Surfaces,” 227th National American Chemical Society Meeting, March 28 – April 1, 2004.

“Molecular Electronics Metrology,” Drexel University, November 19, 2003.

“Organizing Nanoscale Devices on Surfaces,” University of California at Berkeley, October 16, 2003.

“Self-Organizing Materials for Nanoscale Devices,” University of California at Davis, October 14, 2003.

"Nanoscale Studies of Plant Protective Membranes," Interagency Workshop on Nanotechnology and the Environment: Applications and Implications, National Science Foundation, September 15-16, 2003.

"Scanned Probe Investigations of Proteins," Workshop on Tissue Engineering, NIST, August 4, 2003.

"Molecular Electronics," City College of NY IGERT Workshop on Nanoscale Materials and Devices, June 2, 2003.

"Direct Observation of the Tribochemical Restructuring of Mica Surfaces on the Atomic Scale," 225th National Meeting of the American Chemical Society, March 23-28, 2003.

"Adhesion and Friction," Workshop on Nanometrology, NIST, January 27-28, 2003.

"Tales from the Nanoscale: Atomic Level Studies of Friction and Wear of Mica," Long Island University-Brooklyn, October 29, 2002.

"Making Molecular Forces Work for you: Designing Self-Organizing Nanoscale Materials and Devices," Wesleyan University, April 26, 2002.

"Charge Nucleation at Mica Surfaces Studied by AFM," 223rd National ACS Meeting, April 7-11, 2002.

"Caution: Molecular Forces at Work," NIST, February 27, 2002.

"Studies of Molecular Forces at Heterogeneous Surfaces with AFM," Nanoscience in a Mega-City Symposium on Nanotechnology, CUNY-Hunter College, October 20, 2001.

"Bond Energies and Local Chemical Dynamics Probed by Force Microscopy," Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) Annual Meeting, October 10, 2001.

"Probing Local Chemical Interactions and Bond Energies with AFM," 59th Annual Technical Conference of the Society of Plastics Engineers, May 6-10, 2001.

"Surface and Interfacial Studies of Plant Cuticular Membranes with AFM and NMR," Association of Women in Science, Philadelphia Section Meeting, March 28, 2001.

"Studies of Molecular Interactions at Native and Modified Silica Surfaces in Solution," University of Delaware, October 30, 2000.

"Quantifying Single Molecular Forces with AFM," CUNY-Brooklyn College, October 4, 2000.

"Influence of Water on the Nanomechanical Behavior of the Plant Biopolyester Cutin Studied by AFM and Solid-State NMR," 74th ACS Colloid and Surface Science Symposium, June 14-19, 2000.

"Silica Sol-Gel Chemistry at the Single-Bond Level," 74th ACS Colloid and Surface Science Symposium, June 14-19, 2000.

"A Particle Eye View of Bonding in Nanospheric Interfacial Contacts: Looking at Bonds One at a Time," CUNY-Hunter College, May 19, 2000.

"Understanding Molecular Interactions of Silica Nanoparticles for the Design of Sol-Gel Based Photonic Materials," University of Waterloo, April 13, 2000.

"A Look at Interactions in Colloidal Silica Sol-Gels from the Particle's Perspective: Counting Bonds in Nanoscale Contacts" Wayne State University, April 12, 2000.

"Probing Molecular Interactions at Nanospheric Silica Contacts in Aqueous Environments," 219th National American Chemical Society Meeting, Sci-Mix Symposium, March 21-24, 2000.

"Bonding and Interparticle Interactions in Silica Sol-Gels," CUNY-City College, February 28, 2000.

"Quantifying and Controlling Molecular Interactions of Silica Nanoparticles," Lehigh University, November 17, 1999.

"Probing Molecular Interactions at Nanospheric Silica Contacts," University of Maryland at College Park, October 28, 1999.

"Molecular Interactions at Silica Surfaces," 59th Annual Conference on Physical Electronics, July 6-9, 1999.

"Colloidal Interactions at Silica Surfaces," 73rd ACS Colloid and Surface Science Symposium, June 14-19, 1999.

"Adhesion and Wear of Colloidal Silica Probed by Force Microscopy," 217th National American Chemical Society Meeting, March 21-24, 1999.

"Probing Chemical Interactions Between Silica Nanoparticles by Force Microscopy," CUNY-Queens College, December 9, 1998.

"Using AFM to Examine Surface Chemical Interactions on Silicon Dioxide," Ursinus College, November 23, 1998.

"Chemical Interactions in Colloidal Silica Probed by Force Microscopy," 216th National American Chemical Society Meeting, August 23-27, 1998.

"Probing Chemical Interactions Between Colloidal Silica Nanoparticles with Force Microscopy," 58th Annual Conference on Physical Electronics, June 14-17, 1998.

"Structural Studies of Plant Surfaces Using Atomic Force Microscopy," Monsanto, St. Louis, MO, March 24, 1998.

"Probing Colloidal Interactions by Force Microscopy," Drexel University, February 4, 1998.

"New Directions for Scanning Probe Microscopy in Biology & Biophysics", Temple Univ., October 9, 1997.

"Scanning Force Microscopy of Plant Surfaces," 214th National American Chemical Society Meeting, Sci-Mix Symposium, September 7-11, 1997.

"Atomic Force Microscopy of Plant Fruit Cuticles", 213th National American Chemical Society Meeting, Sci-Mix Symposium, April 13-17, 1997.

"Vegetarian AFM", University of California at Berkeley, April 10, 1997.

"Atomic Force Microscopy of Polymer and Biopolymer Materials", University of Southern Mississippi, March 7, 1997.

Research Funding to Date at PI/Co-PI**Current Funding**

AGEP Supplement to CCI Phase 1: NSF Center for the Mechanical Control of Chemistry

Agency: National Science Foundation

Total Award Amount: \$118,786 (direct + indirect)

Award Period: 9/1/2021 – 8/31/2022

CCI Phase 1: NSF Center for the Mechanical Control of Chemistry

Agency: National Science Foundation (lead PI)

Total Award Amount: \$1,800,000 (direct + indirect)

Award Period: 9/1/2020 – 8/31/2023

MRI: Development of a Sub-diffraction Limited Microscope for Imaging Ultrafast Dynamics from the Visible to Mid-infrared Spectral Range

Agency: National Science Foundation (PI: S. Roberts, Co-PIs: Batteas, Biaz)

Total Award Amount: \$1,005,604 (\$118,571 to Batteas)

Award Period: 9/1/2020 – 8/31/2023

Collaborative Research: Studies of Charge Transport in Designed Nanoscale Molecular Assemblies

Agency: National Science Foundation

Total Award Amount: \$345,000 (direct + indirect)

Award Period: 9/1/2020 – 8/31/2023

The Acquisition of an Ambient Pressure X-ray Photoelectron Spectroscopy System for in situ Studies of Interfacial Processes in Materials

Agency: Texas A&M University – Research Development Fund (Co-PIs: S. Banerjee, A. Erdemir, M. Grunlan, M. Radovic, V. Sharma)

Total Award Amount: \$1,529,464 (direct)

Award Period: 2/1/2021 – 12/31/2023

Studies of the Tribological Properties of MoS₂ on Metal, Oxide and Alloy Surfaces

Agency: NTESS, LLC - National Technology & Engineering Solutions of Sandia

Total Award Amount: \$88,605 (direct + indirect)

Award Period: 6/1/2020 – 9/15/2022

Collaborative Research: Experiments and Simulations at the Nexus of Geophysics, Chemistry, Materials Science and Mechanics to Determine the Physical Basis for Rate-State Friction

Agency: National Science Foundation (PI: D. Goldsby, Co-PIs: Batteas, Carpick, Szlufarska)

Total Award Amount: \$639,873 (\$167,977 to Batteas)

Award Period: 3/1/2020 – 2/28/2023

Collaborative Research: Understanding and Tuning the Molecular Arrangement, Charge Storage Properties of Textured Graphene-Ionic Liquid Interfaces

Agency: National Science Foundation

Total Award Amount: \$217,172 (direct + indirect)

Award Period: 6/15/2019 – 5/14/2022

A Brain-inspired Approach to Rapid and Energy Efficient Information Processing: AI on the Fly

Agency: Texas A&M University – X-Grants Program (PI: S. Banerjee)

Total Award Amount: \$1,500,000 (\$65,000 to Batteas labs) (direct)

Award Period: 7/1/2019 – 6/30/2022

Mastering Friction to Reduce Current and Future Energy Needs

Agency: Texas A&M University – X-Grants Program

Total Award Amount: \$500,000 (direct)

Award Period: 7/1/2018 – 6/30/2022

*In Vitro Reconstitution of Crispr-Display: Investigation of LncRNA-Chromatin Interactions***Agency:** Texas A&M Triads for Transformation**Total Award Amount:** \$32,000 (PI: J. Sczepanski, Co-PI's: Batteas, Felts)**Award Period:** 01/15/20 - 12/31/21**Pending Funding***Mechanochromic Materials for Autonomous Real-Time Adhesion and Grip Detection***Agency:** NASA-Jet Propulsion Laboratories**Total Award Amount:** \$52,000 (PI: J. Batteas, Co-PI: M. Cynthia Hipwell, D. Ruffatto)**Award Period:** 10/1/21 - 9/30/22**Past Funding (at TAMU)***Planning Grant: Engineering Research Center for Tribology to Create Reliable, Efficient, Sustainable Transportation***Agency:** National Science Foundation (PI: R. Carpick, Co-PIs: J. Batteas, A. Martini, W. Sawyer)**Total Award Amount:** \$99,999 (direct + indirect)**Award Period:** 9/1/2018 – 8/31/2020*Force Driven Chemical Synthesis of Metal-Organic Frameworks***Agency:** TAMU Energy Institute (PI: J. Felts, Co-PI: J. Batteas)**Total Award Amount:** \$49,953 (direct)**Award Period:** 7/1/2018 – 6/30/2019*Frictional Properties of Single and Few Layer MoS₂***Agency:** NTESS, LLC - National Technology & Engineering Solutions of Sandia**Total Award Amount:** \$50,000 (direct + indirect)**Award Period:** 6/1/2016 – 5/31/2019*Enhancing in Situ Microscopy for Nanoscience and Nanotechnology at TAMU***Agency:** Texas A&M University – Research Development Fund**Total Award Amount:** \$1,568,996 (direct)**Award Period:** 6/1/2016 – 5/31/2019*Frictional Properties of Single and Few Layer MoS₂***Agency:** NTESS, LLC - National Technology & Engineering Solutions of Sandia**Total Award Amount:** \$24,440 (direct + indirect)**Award Period:** 6/1/2018 – 9/15/2018*Frictional Properties of Single and Few Layer MoS₂***Agency:** NTESS, LLC - National Technology & Engineering Solutions of Sandia**Total Award Amount:** \$20,000**Award Period:** 06/01/2018 – 09/15/2018*Studies on the Use of Atomically Thin Films for Controlling Friction and Adhesion at Interfaces***Agency:** National Science Foundation**Total Award Amount:** \$336,724 (direct + indirect)**Award Period:** 8/1/2014 – 7/31/2018*REU Site: Biological, Green and Materials Chemistry Research at Texas A&M***Agency:** National Science Foundation**Total Award Amount:** \$300,000 (direct + indirect) (PI: Holly Gaede, Co-PI: Batteas)**Award Period:** 4/1/2014 – 3/31/2018*Charge Transport in Confined Molecular Assemblies***Agency:** National Science Foundation**Total Award Amount:** \$334,000 (direct + indirect)**Award Period:** 8/1/2012 – 7/31/2016

*Development of Conductive Nanocoatings to Promote RF Shielding***Agency:** Nike IHM (PI: J. Grunlan, Co-PI: J. Batteas)**Total Award Amount:** \$79,090 (\$18,834 to Batteas, direct + indirect)**Award Period:** 1/15/2016 – 7/15/2016*Studies of Friction and Adhesion in Nanoscale Asperity-Asperity Contacts***Agency:** National Science Foundation**Total Award Amount:** \$309,517 (direct + indirect)**Award Period:** 9/1/2011 – 8/31/2015*REU Site: Biological, Environmental and Materials Chemistry Research at Texas A&M***Agency:** National Science Foundation**Total Award Amount:** \$300,071 (direct + indirect) (PI: Holly Gaede, Co-PI: Batteas)**Award Period:** 4/1/2011 – 3/31/2015*Solvation Studies of Responsive Polymers in Solution and at Surfaces***Agency:** National Science Foundation (PI: Bergbreiter, Co-PI: Batteas)**Total Award Amount:** \$420,000 (\$187,000, direct + indirect to Batteas lab)**Award Period:** 9/1/2009 – 1/31/2013*Collaborative Research: Conduction in Confined Molecular Assemblies***Agency:** National Science Foundation**Total Award Amount:** \$350,500 (direct + indirect)**Award Period:** 7/1/2009 – 1/31/2013*Probing the Role of Surface Defects and Disorder on the Tribology of Nanoscopic Contacts***Agency:** National Science Foundation**Total Award Amount:** \$217,075 (direct + indirect)**Award Period:** 7/1/2008 – 6/30/2012*Emerging Methodologies for Molecular Structure Determination of Biological Solids***Agency:** National Science Foundation**Total Award Amount:** \$512,137 (PI: Ruth Stark, Senior Personnel: Batteas, Cowburn & Stokes)**Award Period:** 3/1/2008 – 2/28/2013*Note: This was an NSF Research Coordination Network project funded out of CCNY.**REU Site: Biological, Environmental and Materials Chemistry Research at Texas A&M***Agency:** National Science Foundation**Total Award Amount:** \$272,635 (direct + indirect) (PI: Holly Gaede, Co-PI: Batteas)**Award Period:** 3/1/2008 – 2/28/2012*Fueling the Hydrogen Economy: Catalytic Approaches to Hydrogen Production***Agency:** TAMU Energy Resources Program (PI: Goodman, Co-PIs Batteas and Cremer)**Total Award Amount:** \$400,000 (\$133,335 direct to Batteas lab)**Award Period:** 5/1/2008 – 8/31/2010*Loop Heat Pipe Failure Diagnosis***Agency:** Boeing Corporation**Total Award Amount:** \$28,638 (direct + indirect)**Award Period:** 4/1/2007 – 12/31/2007*Loop Heat Pipe Failure Diagnosis***Agency:** Boeing Corporation**Total Award Amount:** \$74,507 (direct + indirect)**Award Period:** 4/1/2007 – 12/31/2007*Probing Molecular Interactions and Defect Nucleation in Nanoscopic Contacts***Agency:** The Robert A. Welch Foundation**Total Award Amount:** \$150,000 (direct)**Award Period:** 6/1/2006 – 5/31/2009

Scanned Probe Lithography Approaches for the Fabrication of Plasmon Enhanced Quantum Optics

Agency: Texas Higher Education Board Advanced Research Program

Total Award Amount: \$100,000 (direct)

Award Period: 5/1/2006 – 1/31/2009

Past Funding (at NIST)

In vivo 3-D Mapping of Nanoparticle Biomarkers in Cells and Tissues

Agency: NIST

Total Award Amount: \$100,000 (direct)

Award Period: 10/2004 – 9/2005

Past Funding (at CUNY)

*Understanding the Hardening Syndrome of Potato (*Solanum tuberosum* L.) Tuber Tissue to Eliminate Textural Defects of Fresh and Fresh-Peel/Cut Products*

Agency: US-Israeli BARD (PI: Ilan Shomer, J.D. Batteas, Co-PI with 2 others)

Total Award Amount: \$345,000 (\$27,000 direct to Batteas labs)

Award Period: 11/2002 – 10/2005

Symposium on Applications of Scanned Probe Microscopy to Polymers

Agency: ACS-PRF

Total Award Amount: \$3,600 (direct)

Award Period: 4/2003 – 8/2003

Development of Nanoscale Stochastic Methods for Smart Biochemical Assays

Agency: CUNY NIH PO1 Groundwork Grant

Total Award Amount: \$50,000 (direct)

Award Period: 6/2002 – 12/2003

Acquisition of an X-Ray Photoelectron Spectrometer for Surface Chemical Analysis

Agency: National Science Foundation

Total Award Amount: \$125,155 (direct)

Award Period: 8/2001 – 7/2003

ACS-PRF Summer Research Fellowship Supplement

Agency: ACS-PRF

Total Award Amount: \$8,000 (direct)

Award Period: 5/2002 – 8/2002

Advanced Methods of Surface Analysis for Polymer Chemistry

Agency: NYS Graduate Research and Technology Initiative

Total Award Amount: \$54,814 (direct)

Award Period: 8/2001 – 7/2003

Molecular Tribology Studies of Silica Asperity-Asperity Contacts

Agency: PSC-CUNY Research Awards

Total Award Amount: \$9,820 (direct)

Award Period: 7/2001 – 6/2003

Research Experiences for Undergraduates in Polymers and Biopolymers

Agency: National Science Foundation (PI: R.E. Stark, J.D. Batteas, Co-PI)

Total Award Amount: \$180,000 (direct + indirect)

Award Period: 2/2001 – 3/2004

Influence of Environment on the Structure and Dynamics of Plant Cuticular Surfaces

Agency: US Department of Agriculture

Total Award Amount: \$110,000 (direct + indirect)

Award Period: 9/2000 – 8/2003

Probing Bonding Interactions in Silica Sol-Gels with Force Microscopy

Agency: American Chemical Society-Petroleum Research Fund

Total Award Amount: \$25,000 (direct)

Award Period: 8/1999 – 8/2002

Scanning Probe Technology Development for Materials Analysis

Agency: NYS-Graduate Research and Technology Initiative

Total Award Amount: \$37,800 (direct)

Award Period: 8/1999 – 12/2000

Probing Adhesion, Friction and Wear of Single Silica Nanoparticles

Agency: PSC-CUNY Research Awards

Total Award Amount: \$9,093 (direct)

Award Period: 7/1999 – 12/2001

Nanostructural Materials and Devices

(PI: D.L. Akins, CUNY-City College, J.D. Batteas, Co-investigator with 10 others)

Agency: NSF-Integrated Graduate Education and Research Training (IGERT) Program

Total Award Amount: \$2,742,000 (\$110,000 direct, to Batteas labs)

Award Period: 8/1999 – 7/2004

Probing the Microstructure and Mechanical Properties of Plant Protective Surfaces

Agency: PSC-CUNY Research Awards

Total Award Amount: \$5,917 (direct)

Award Period: 7/1998 – 12/1999

A Combined Atomic Force/Infrared Microscope (AFIRM) for Nanometer Scale Materials Analysis of Ultrathin Films

Agency: Research Corporation: Research Innovation Award

Total Award Amount: \$34,775 (direct)

Award Period: 12/1997 – 12/2002

Application of Force Microscopy to the Study of Plant Tissue Morphologies

Agency: US Department of Agriculture

Total Award Amount: \$50,000 (direct + indirect)

Award Period: 9/1997 – 9/2000

Probing the Microstructure and Mechanical Properties of Plant Protective Surfaces

Agency: PSC-CUNY Research Awards

Total Award Amount: \$5,000 (direct)

Award Period: 6/1997 – 12/1998

Tribochemistry of Lubricant Additives Studied by Atomic Force Microscopy

Agency: Exxon Chemical

Total Award Amount: \$27,000 (direct)

Award Period: 4/1997 – 12/2003

RESEARCH PERSONNEL TRAINED IN THE BATTEAS GROUP

86* TO DATE: 30 graduate students, **41** undergraduate students, **11** post-doctoral fellows and **5** visiting researchers

**41 of the 86 researchers trained have been from underrepresented groups in STEM*

Graduate Students**TAMU**

Mr. Ammon Pickett (M.S. 8/2008) – Faculty at Clearlake High School, Houston, TX.
Dr. Yang-Hsiang Chan (Ph.D. 2010) – Professor, National Chiao Tung University
Dr. Jixin Chen (Ph.D. 2010) – Associate Professor, Ohio University
Dr. Amanda Schuckman (Ph.D. 2010) – Hewlett Packard
Lt. Ainsley Allen (M.S. 2011) – (joint student with Dave Bergbreiter) – Lab Chief, Air Force Petroleum Office
Dr. Ryan Jones (Ph.D. 2011) – Total Petrochemical
Dr. Albert Wan (Ph.D. 2011) – Principal Engineer, TSMC, Singapore
Dr. Chi-Yuan Chang (Ph.D. 2013) – Intel Corporation
Dr. Arika Pravitisari (Ph.D. 2013) – Intel Corporation
Dr. Brad Ewers (Ph.D. 2014) – United Services Automobile Association
Ms. Carrie Carpenter (M.S. 2014) – Adjunct Faculty, Indiana University Bloomington
Dr. Stephanie Skiles (Ph.D. 2014) – Assistant Professor, University at Central Oklahoma
Dr. Jessica Spear (Ph.D. 2015) – Research Scientist, University of Illinois at Urbana-Champaign
Dr. Alison Pawlicki (Ph.D. 2016) – Research Scientist, Oak Ridge National Labs
Dr. Meagan Elinski (Ph.D. 2018) – Assistant Professor, Hope College
Dr. Abhishek Parija (co-advisor with S. Banerjee, Ph.D. 2019) – Intel Corporation
Dr. Cody Chalker (Ph.D. 2019) – University of California at Davis
Dr. Zhuotong Liu (Ph.D. 2020) – Frontage Laboratories
Dr. Fanglue Wu (Ph.D. 2021) – Brewer Science

Current

Ms. Maelani Negrito (co-advised with M. Sheldon) (2015 – present)
Mr. Nate Hawthorne (2016 – present)
Mr. Quentarius Moore (2017 – present) – DOE Computational Graduate Fellow
Ms. Cindy Chen (2018 – present)
Ms. Maya Costales (2020 – present)
Mr. Erik Straume (2020 – present)
Ms. Piyashi Sengupta (2021 – present)

CUNY

Ms. Xuhui Quan (M.S. 1999) – Abbott Medical Devices
Dr. Tatiana Milic (co-advisor with C.M. Drain, Ph.D. 2002) – Senior Research Scientist, AMRI
Dr. James Helt (Ph.D. 2005) – Staff Scientist – Aerospace Corporation
Dr. Chang Xu (Ph.D. 2005) – Research Scientist – Global Research Group, Siberline Manufacturing Co

Undergraduate Research Students**TAMU**

Ms. Katie Walton (TAMU Undergraduate Research Scholar, '06 – '07); Ms. Nicole Pearsall; Ms. Stephanie Skiles (REU '08); Ms. Jamie Wheeler (TAMU Undergraduate Research Scholar, '08 – '09); Ms. Kathy Webb (TAMU Undergraduate Research Scholar, '08 – '10); Ms. Bronwyn Harrod (REU '09 – '10); Mr. Ben Cotts (REU, '10); Mr. Daniel Bueso-Mendoza (LSAMP '10 – '11); Mr. Juan Callejas (REU '11); Mr. Robert Lye ('11 – '12); Ms. Megan Link (1/12 – 5/12); Ms. Meagan Elinski (REU '12); Ms. Kristin Light (1/13 – 7/13); Mr. Alexis Blanco (1/13 – 12/13); Mr. James Custer (REU '13); Mr. Jose Zavala (REU '14); Mr. Angel Villalpando ('15); Ms. Erin Avery (REU '15), Ms. Morgan Grandon (REU '16); Mr. Thomas Reyes (REU '17); Mr. Ben Menard ('15 – '18); Ms. Abby Starke ('16 – '18); Ms. Meredith Buzbee ('16 – '18); Mr. Andrew Brown (REU '19); Ms. Mckenzie Pedley ('18 – '20)

Current

Mr. Noah Sheehan ('18 – present), Mr. Jimmy Ha ('21 – present)

CUNY

Ms. Elizabeth Corbo; Ms. Soa Dang; Ms. Racha Estaphen; Ms. Rima Estaphen; Ms. Janean Gamble (REU '02); Ms. Adrienne Gilbert; Mr. James Helt; Mr. Randy Jackson (REU '03); Ms. Carolyn Kitchens (REU '04 & '05); Ms. Susan Meserole; Ms. Denise Pate; Ms. Deena New; Mr. Joe Sciafani; Ms. Heather Sommers (REU '01).

Postdoctoral Fellows**TAMU**

Dr. Gang Liang (9/05 – 8/06) – Facilities Manager, Rice University
Dr. Qingsheng Liu (12/07 – 6/09) – Lecturer-James Madison University
Dr. Xiaoting Hong (3/09 – 12/09) – Associate Professor, South China Normal University
Dr. Agustin Diaz (8/12 – 8/14) – Ford Foundation Fellow (2011), now at REM Surface Engineering
Dr. Abhijeet Gujrati (11/2 – 08/21) – Taiwan Semiconductor Manufacturing Corporation (TSMC)

NIST

Dr. Jayne Garno ('02 – '04) – Professor, Louisiana State University – PECASE Awardee
Dr. Lucile Teague ('04 – '05) – Advanced MicroDevices
Dr. Jamie Kim ('04 – '05) – Associate Professor, Buffalo State College
Dr. Jeremy Beebe (1/05 – 8/05) – Research Chemist – Dow Chemical

CUNY

Dr. Andrew Round ('98 – '99) – Academic Fellow – University of East Anglia, UK
Dr. Ning Chi ('99 – '02) – Adjunct Faculty, Essex County College

Visiting Scholars**TAMU**

Professor Leihua Xu, China University of Mining and Technology (8/2015 – 8/2016)
Professor Shengmao Zhang, Henan University (3/2015 – 6/2015)
Dr. Ayelet Vilan, Weizmann Institute (7/2013 – 7/2014)

CUNY

Professor Eric Williamson, Ursinus College (Summer 2002)

Current

Dr. Annette Raigoza, College of St. Benedict/St. John's University (7/2021 – 12/2021)

Awards Received by my Students at TAMU**2018****Thomas Reyes**

NSF LSAMP Bridge to the Doctorate Fellowship

Nathaniel Hawthorne

Best Poster Award, Gordon Research Conference on Tribology

2017**Meagan Elinski**

2017 Phil Gramm Doctoral Fellowship recipient

Quentarius Moore

Department of Energy Computational Science Graduate Fellowship (DOE-CSGF)

Thomas Reyes

Best Poster Award, 44th Annual (National Organization for the Professional Advancement of Black Chemistry and Chemical Engineers (NOBCChE) Conference, October 30-November 1, 2017.

2015Meagan Elinski

Honorable Mention for the 2015 NSF Graduate Research Fellowship

Nathaniel Hawthorne

First Year Chemistry Program Teaching Award – 2014

2014Mr. Bradley Ewers

Beta Beta Chapter of the Phi Lambda Upsilon Honorary Chemical Society 2014 Sharon Dabney Memorial Scholarship. May 8, 2014.

Texas A&M Department of Chemistry Thomas J. Hairston Memorial Graduate Scholarship. May 8, 2014.

Texas A&M Association of Former Students Distinguished Graduate Student Award for Excellence in Teaching. April 27, 2014.

2014 U.S. Senator Phil Gramm Doctoral Fellowship for Excellence in Teaching and Research. April 10, 2014.

Meagan Elinski

Association of Former Students 2014 Graduate Merit Fellowship

Honorable Mention for the 2014 NSF Graduate Research Fellowship

Ms. Alison Pawlicki

Awarded an NSF Graduate Research Fellowship (2011 – 2014)

Jessica Spear

Graduate Student Poster Presentation Award from the Division of Colloids and Surface Science of the American Chemical Society, 247th National ACS Meeting, 247th ACS National Meeting of the American Chemical Society, March 16-20, 2014.

Best Graduate Student Poster Presentation Award- Gold Level, Society of Tribologists and Lubrication Engineers (STLE), May 18 – 22, 2014.

Stephanie Skiles

First Year Chemistry Program Teaching Award – 2014

2013Bradley Ewers

1st Place Oral Presentation Student Research Week, Texas A&M University, College Station, TX, March 28, 2013.

Graduate Student Poster Presentation Award from the Division of Colloids and Surface Science of the American Chemical Society, 245th National ACS Meeting, New Orleans, LA. April 2013.

Texas A&M Department of Chemistry Upper Level Laboratory Teaching Award, College Station, TX, May 2013.

Texas A&M Department of Chemistry Travel Award, College Station, TX, May 2013.

Selected speaker for the BASF-TAMU Graduate Student Research Symposium, College Station, TX, August 1, 2013.

Alison Pawlicki

Awarded an NSF Graduate Research Fellowship (2011 – 2014)

Stephanie Skiles

TAMU Student Research Week Award Winning Poster – 2nd Place

TAMU; March 2013 PLU Travel Award, TAMU, 2013

2012Agustin Diaz

Awarded a Ford Foundation Postdoctoral Fellowship (2011 – 2012)

Alison Pawlicki

Awarded an NSF Graduate Research Fellowship (2011 – 2014)

2011Carrie Carpenter

First Year Program Teaching Award, 2011

Dr. Agustin Diaz

Awarded a Ford Foundation Postdoctoral Fellowship (2011 – 2012)

2010Jixin Chen

Dow Scholarship for Graduate Chemical Research, 2010

2009Jixin Chen

E. Martell Travel Awards, Texas A&M University, 2009

Graduate Student Research and Presentation Travel Awards, Texas A&M University, 2009

Amanda Schuckman

Best Student Poster Award, COLL Division, 238th National American Chemical Society Meeting, March 23, 2009.

Selected for the 2009 US Senator Phil Gramm Doctoral Fellowship Award from Texas A&M University, April 2, 2009.

Albert Wan

E. Martell Travel Award, Texas A&M University, 2009.

Kathy Webb

“Characterization of Porphyrin Thiol Assemblies on Au(111),” *Texas A&M Student Research Week*, College Station, TX, United States, March 23-27, 2009 (Poster). *Awarded second place.*

Jamie Wheeler

Texas A&M Student Research Week, College Station, TX, United States, March 23-27, 2009 (Poster). *Awarded first place.*

2008Yang-Hsiang Chan

“Using patterned arrays of metal nanoparticles to probe plasmon enhanced luminescence of CdSe quantum dots on GaAs,” Materials Characterization Facility Open House (TAMU), November 13, 2008 (Poster). *1st prize in the Poster Session*

“Using Patterned Arrays of Metal Nanoparticles to Probe Plasmon Enhanced Luminescence of CdSe Quantum Dots on GaAs,” Student Research Week, March 24-28, 2008 (Poster). *2nd prize in the Poster Session and Session winner in Materials Science.*

2007Ryan Jones

Tribological Properties of Organosilane Self Assembled Monolayers in Silica Asperity-Asperity Junctions. Texas A&M Student Research Week, College Station, TX, United States, March 26-30, 2007 (Poster – *Won 1st prize*).

Amanda Schuckman

“Characterization of thiol tethered porphyrin derivatives on gold,” Student Research Week, Texas A&M University, March 26-30, 2007 (Poster – *Won 3rd prize*).

“Surface organization of thiol tethered tri-pyridylporphyrin derivatives on gold,” Industry-University Cooperative Chemistry Program, Texas A&M University, October 29-30, 2007 (Poster – *Selected for a top poster award*).

Albert Wan

“Effects of Surface Energy on the Size of Corrolazine Nanoparticles,” Student Research Week, Texas A&M University, March 26-30, 2007 (Poster – *Won 2nd prize*).

2006Ryan Jones

First Year Program Teaching Award, 2006

TEACHING and OUTREACH

Courses taught at TAMU

Graduate Level

CHEM 601 – Analytical Chemistry I (*taught 3 times*)
CHEM 602 – Analytical Chemistry II (*taught 5 times*)
CHEM 623 – Surface Chemistry (*taught 6 times*)

Undergraduate Level

CHEM 415 – Analytical Chemistry (*taught 6 times*)
CHEM 315 – Quantitative Analysis I (*taught 4 times*)
CHEM 325 – Physical Chemistry Laboratory I (*taught 1 time*)
CHEM 326 – Physical Chemistry Laboratory II (*taught 1 time*)
CHEM 107 – General Chemistry for Engineers (*taught 1 time*)
CHEM 101 – General Chemistry for Majors (*taught 2 times*)

Other supervisory Responsibilities

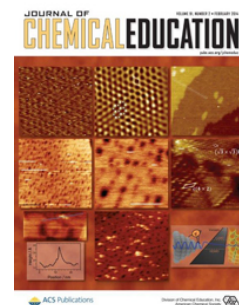
CHEM 318 – Quantitative Analysis Laboratory (*4 times*)
CHEM 491 – Research, undergraduate level (*15 times*)
CHEM 691 – Research, graduate level (*every semester*)
MSEN 691 – Research, graduate level (*every semester*)

Course Development

I have been involved in a variety of course development initiatives during his time at TAMU. Below are examples where individually, or together with other colleagues I implemented new educational plans for our students. Always wanting to bring cutting edge research into the class room, several of these below noted developments act to connect my ongoing research with the courses I am teaching.

1. CHEM 325/326: Physical Chemistry Lab. Starting in 2008, as part of a multi-faculty team, we worked to completely redesign the undergraduate physical chemistry lab curriculum. Physical chemistry is renowned for being one of the more challenging courses for chemistry majors. One of the obstacles in engaging students in the physical chemistry laboratory courses difficulty is lack of direct visualization of key fundamental principles and the incorporation of modern instrumentation. Our redevelopment of the laboratory courses includes adopting experiments which better reflect the current state of physical chemistry research. This involves the utilization of modern techniques and instrumentation and the application to problems in material science, biological chemistry, environmental chemistry and other areas of current interest. To enhance the research based feel of the experiments, we have also moved to multi-week experiments, or modules, which permit ample time for the students to experience authentic inquiry and become familiar with equipment and techniques. Lastly, the students submit their written reports in scientific journal (Journal of Physical Chemistry) format.

As a component of this lab development, I introduced a 3-week module on imaging of surfaces: *Visualization of Atoms and Molecules Using Scanning Tunneling Microscopy*. This lab provides an introduction to the basic methodology of a scanning probe microscope and the utilization the technique to explore the structure and electronic properties of materials. Topics include imaging of graphite, metal, and semiconductor surfaces, and charge transport through molecules on surfaces. Students examine tunneling distance dependence in air and through molecules with varying chain length. Also, modeled on his research activities on tunneling in porphyrins on surfaces (described in the Research Portfolio), students measure the tunneling decay constant of *single* molecules. The new lab, developed along with then graduate students Brad Ewers and Amanda Schuckman, was published in the *Journal of Chemical Education* (“Why Did the Electron Cross the Road? A Scanning Tunneling Microscopy (STM) Study of Molecular Conductance for the Physical Chemistry Lab,” *J. Chem. Educ.* 91 (2014) 283-290), and was highlighted by the journal as a cover article. This lab has been adopted at UT-Austin and UCLA.



Building off of this, I am now in the process of developing a new physical chemistry lab module on measuring chemical forces using atomic force microscopy, based on the work in his lab, as well as the research in the new NSF Center for the Mechanical Control of Chemistry. This new laboratory experience will allow student to measure chemical bonds down to the single molecule level and determined different bond energies and how different interfacial interactions control materials properties such as friction, adhesion and mechanical stiffness.

2. CHEM 623: Surface Chemistry. I started teaching CHEM 623 for the first time in Spring 2013. In that (and each subsequent time it was offered) this course was widely subscribed and included students from chemistry, materials science, chemical, biomedical, mechanical and petroleum engineering. Some students from agriculture have also taken the course. Given the broad clientele, I restructured this traditionally physical chemistry centered course to one taught as a survey course with an emphasis on surface analysis, heterogeneous catalysis, thermodynamics and kinetics of surfaces, nanomaterials, and soft matter. Including traditional lectures and online assignments, due to the breadth of student backgrounds taking this course, we would conclude each semester with presentations on topics from the course by the students as it related to their own research. The presentations were graded using the same rubric as our CHEM 481 course on science communications to give students feedback on their presentations. Students also submitted a terms paper on the same topic. Subject mastery was guided by homework and in class written exams.

3. CHEM 101: Fundamentals of Chemistry I. Among more recent course development activities, in Fall 2015 and Fall 2018, I taught CHEM 101, the freshman introductory course for our chemistry major's. As a formative class, first year chemistry is one the most challenging classes to teach. Here I chose to teach the course in a segment format, not unlike a talk show, with unique segments that would get students into a particular rhythm of learning. These segments included in-class integrative clicker quizzes, interspersed with discussions, lecture topics and active demonstrations. Not surprisingly the demonstration segment was a class favorite, as in this segment, the demonstration of a particular chemical principle was always tied into the lecture, but usual ending with an explosive result. Hence the demonstration segment was titled "Light it Up!" One of the demonstrations, "The Self-Carving Pumpkin," which he highlighted online via Twitter (see link below) was a student favorite, teaching students about the thermodynamics of gas forming reactions and using that to explode a face directly into a pumpkin. This demonstration was of course featured around Halloween for optimal effect. *Twitter link to video of the demo:* (<https://twitter.com/jamesbatteas/status/770073608584568840?s=20>).

Public Outreach Activities

My outreach activities have largely centered around four main activities: (1) a tour stop for the Chemistry Open House (2014-present); (2) the development and running of the TAMU Youth Adventure Program Summer Camp in Nanotechnology (2016-present); (3) faculty advisor to the TAMU chapter of the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE); and (4) outreach via social media, having been named one of 25 chemists to follow on Twitter.

Chemistry Open House. Since 2013 my lab has been a tour stop for the TAMU Chemistry Open House, where we engaged elementary school children in hands-on experiments on nanoscience. Here, young learners are exposed to demonstrations using scanning probe lithography to allow children to "paint" nanoscale patterns on a surface of Si. The "nanoart" created by the students could then be 3D printed for them to take home, where the scale of the features they made was discussed with them. Students were also shown atomic scale structure of graphite using scanning tunneling microscopy to help them visualize atoms and the arrangement of atoms in materials to discuss how that relates to materials properties. We named this demo "*The Atomic Canvas*." <https://www.chem.tamu.edu/rgroup/batteas/WebLinked/LeapAFMvid/LeapAFMvid.html>

TAMU Youth Adventure Program (YAP) Camp in Nanotechnology. Building on our open house demos, we developed a Youth Adventure Program Camp in Nanotechnology which was offered for the first time in the Summer of 2016. Information on the camp can be found at: <http://yap.tamu.edu/>. Each summer (except in 2020, due to COVID-19) the camp has enrolled twelve (12 - 14) 7th – 11th grade students who spend a week at TAMU in our labs. The first camp (2016) was run in conjunction with Dr. Jaime Grunlan. Funds for this were supported by the Office of the Chancellor for TAMUS and focused on top down and bottom-up nanofabrication where students learned about nanolithography and layer-by-layer polymer assembly to create flame retardant materials. We expanded this camp in 2017 to include the design and synthesis of nanomaterial for oil recovery in conjunction with Dr. Karen Wooley's lab. Students learned to use magnetic force microscopy to study their nanoparticles. They also learned about how nanoparticle can be used to oil cleanup.

In 2018, inspired by the selection of the X-grant on Mastering Friction that I led, we developed an entirely new sequence on friction. Here, again with the Wooley lab, students learned about the different chemical and mechanical properties of polymers. They also learned about how to measure friction on the macro- and nanoscales in my lab. Using this knowledge, the students then 3D printed tires for LEGO cars that were then raced on different courses where the friction between the tires and the track would determine the winner. From this, students were able to deduce the relationships between chemical forces, mechanical properties (hardness/softness) of a material and friction. In summer 2019 he again ran the camp in conjunction with Dr. Karen Wooley in TAMU Chemistry. As the theme for the summer was "Video Games," the students spent one week in our labs learning about the use of top-down and bottom-up nano-and microfabrication techniques using the clean room at Aggie Fab, and using the scanning probe microscopes in the Batteas labs. Students worked with the Wooley lab to develop an understanding of positive and negative photo-resist chemistry

that was using in the Aggie Fab. Students used what they learned to pattern games made from microfluidic devices of their own design.

In summer 2021, the camp was paired with the Biotechnology camp. Students were introduced to the basic concepts of molecular self-assembly and micro- and nanofabrication using colloid particle lithography and scanning probe lithography. Paired with the biotechnology camp under the direction of Dr. Jonathan Sczepanski, we integrated the concepts of DNA origami, with microfabrication to allow students to build DNA sensors on glass slides and to image these using confocal fluorescence microscopy. In summer of 2022 we will launch our newest YAP Camp, *Smash Chemistry*, where students will be introduced to the field of mechanochemistry.

NOBCChE. Since the formation of the chapter, I have been the faculty advisor to our TAMU chapter of NOBCChE. In that time, the chapter has sponsored a number of outreach activities, including: (1) hosting a table on hydrophobic and hydrophilic materials at the Chemistry Open House (annually), (2) chemistry demos at the Brazos Valley Community Center (annually) and (3) in 2018, hosting an exhibit that was displayed at the Memorial Student Center highlighting the accomplishments of Percy L. Julian Awardees of NOBCChE for National Chemistry Week.

Social Media. In 2017, I was named by *Chemical & Engineering News* as one of twenty-five chemists to follow on Twitter (November 2017). <https://cen.acs.org/articles/95/web/2017/11/25-Chemists-should-follow-Twitter.html> (last accessed 06/07/2021). Having first joined Twitter in 2013, I have used this platform to engaged with the public and the science community to highlight not only our own research, but to give the public insight into being a chemistry professor. Presently my account has more than 3200 followers. Because of this I was invited to host the @realscientists Twitter feed (with over 83,000 followers) during national chemistry week in 2017, where I highlighted my research on friction and did demos from his CHEM 101 class. Lastly, in March 2018, 2019 and 2020, I participated in the Royal Society of Chemistry sponsored Twitter Poster Session (#RSCposter), as a member of their executive committee, which led to me be selected as co-chair of the nanoscience section for the March 3, 2020 poster session (#RSCNano).

SERVICE**Departmental**

Member, Chemistry Department Promotion and Tenure Committee (1/2016 – 1/2019)
Faculty Advisor TAMU NOBCCChE Chapter (8/2011 – present)
Member, Faculty Research Awards Committee (8/2015 – present)
Chair, Analytical Chemistry Division (3/2011 – 8/2015)
Member, Chemistry Department Executive Committee (1/2011 – 12/2014)
Member, Chemistry Department Academic Operations Committee (3/2011 – 8/2015)
Graduate Recruiting Coordinator-TAMU-Chemistry (9/2007 – 8/2011)
Chair, Graduate Admissions and Review Committee (9/2007 – 8/2011)
Member, Graduate Admissions and Review Committee (9/2006 – 8/2012)
Co-PI TAMU NSF-REU in Chemistry (3/2008 – 4/2018)
Member, Faculty Search Committee – Analytical and Physical (ad hoc)
Student Awards Coordinator TAMU Industry-University Chemistry Cooperative Program (IUCCP)-2008
Member, Shops Committee (9/2008 – 9/2009)
Member, Graduate Curriculum Committee (5/2009 – 9/2015)

College

Associate Dean for Research, College of Science (1/2017 – 8/2020)

University

Associate Dean for Research, College of Science (1/2017 – 8/2020)
Member, University Research Council (1/2017 – 8/2020)
Member, TAMU-JPL SURP Coordination Committee (11/2018 – 8/2020)
Chair, Council of Principal Investigators (9/2016 – 1/2017)
Vice Chair, Council of Principal Investigators (9/2015 – 8/2016)
Executive Committee – Member, Council of Principle Investigators (9/2014 – 1/2017)
Member, Council of Principal Investigators (9/2014 – 2017)
Director, Materials Characterization Facility (9/2012 – 8/2017)
Member, Research Development Fund Advisory Committee (2/2015 – 9/2016)
Member, Materials Characterization Facility Oversight Committee (9/2013 – present)
Member, Advisory Committee – Microscopy Center (9/2007 – 8/2010)
Member, Executive Committee – Materials Science and Engineering Program (9/2010 – 9/2016)

National/International

Scientific Advisory Board, EPSRC Programme Grant: “Molecular Photonic Breadboards” (5/2021 – present)
Chair-Elect, American Chemical Society, Division of Colloid and Surface Chemistry (1/2021 – present)
Vice Chair, American Chemical Society, Division of Colloid and Surface Chemistry (1/2020 – 12/2020)
American Chemical Society Awards Committee (3/2017 – present)
Editorial Advisory Board, ACS Central Science (12/2014 – present)
Editorial Board, RSC Advances (4/2011 – present)
Associate Editor, RSC Advances (4/2011 – 1/2014)
Editorial Board Member, *ISRN Nanotechnology* (2011 – 2013)
Chair, Polymer Analysis Division, Society of Plastics Engineers (2006 – 2007)
Board of Directors, Polymer Analysis Division, Society of Plastics Engineers (2003 – 2008)
Chair, TAMU Section of the American Chemical Society (2008)
Ad Hoc Panel Member and Keynote Speaker – American Chemical Society – Undergraduate Programs – *Grad School Reality Check* (2008 – 2010)
Fellow, Royal Society of Chemistry
Member, American Chemical Society
Member, American Association for the Advancement of Science
Member, National Organization for Black Chemists and Chemical Engineers

*Symposia Organized:**Chair and Organizer:*

Symposium on Mechanochemistry and Tribochemistry, IUPAC World Chemistry Congress 2021, Montreal, Canada (Virtual) – August 13-21, 2021.

Applications of Scanning Probe Methods, 95th ACS Colloid and Surface Science Symposium, June 14-16, 2021 (Virtual)

Fundamental Studies of Mechanochemical and Tribochemical Processes at Interfaces, 255th National Meeting of the American Chemical Society, March 18-22, 2018.

Crafting Chemical Communications, 252nd National Meeting of the American Chemical Society, August 21-26, 2016

Frontier Applications of Nanotechnology in Engineering Extracellular Matrices, 238th National Meeting of the American Chemical Society, March 22 – 26, 2009.

Symposium on Processes at Functional Plasmonic and Electronic Interfaces, 234th National Meeting of the American Chemical Society, August 19-23, 2007

Symposium on Scanning Probe Microscopy, Southwest Regional ACS Meeting, Houston, TX, October 21, 2006

Symposium on Polymer Surfaces and Interfaces, Society of Plastic Engineers, ANTEC 2006 May 7 – 10, 2006

Symposium on High Resolution Microscopy of Polymers, Society of Plastics Engineers, ANTEC 2004, May 16-20, 2004

Symposium on Optoelectronic Materials, Society of Plastic Engineers, ANTEC 2003, May 4-8, 2003

Symposium on Application of Scanning Probe Microscopy to Polymers, 225th National Meeting of the American Chemical Society, March 23-28, 2003

Organizer:

Mechanochemistry: Fundamentals, Application and Future, Faraday Discussion, September 12-14, 2022.

Symposium on Science, Technology and Applications of Dip-Pen Nanolithography, SPIE International Symposium on MOEMS-MEMS, January 24-29, 2009.

Session on Molecular Electronics in Symposium on Self-Assembled Photonics, PacifiChem, December 15-20, 2005.

Publications Reviewer:

Tribology Letters, Langmuir, J. Am. Chem. Society, ACS Nano, Analytical Chemistry, J. Phys. Chem., Scanning, Biophysical Journal, PNAS, J. Mater. Chem., Chemical Reviews, J. Polymer Sci., Solid State Chemistry, Surface Science, ACS Applied Materials and Interfaces, J. of Colloid and Interface Science, Nanotechnology, RSC Advances, Nature Communications.

Proposal Reviewer:

NSF, NIH, Research Corporation, ACS-PRF, PSC-CUNY Grants Program, DOE, DFG, Netherlands Organization for Scientific Research, Swiss National Science Foundation
