

NORMAN J. WAGNER

Robert L. Pigford Chaired Professor of Chemical Engineering
Department of Chemical and Biomolecular Engineering
(Researcher ID B-6558-2012)

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RESEARCH INTERESTS:

Rheology, neutron light and x-ray scattering, nanotechnology, thermodynamics and rheology of colloidal suspensions and self-assembled surfactant solutions, structured polymers, self-assembly in ionic liquids, rheo-optics, nonequilibrium statistical mechanics, parallel simulation of complex fluids and molecular transport phenomena.

EDUCATION:

Princeton University, Department of Chemical Engineering, 9-84 to 10-88

Degree: Ph.D., Advisor: Professor William B. Russel.

Thesis: "Nonequilibrium Statistical Mechanics of Concentrated Dispersions"

Proposition: "Analysis of Chemical Tracer Scavenging in the Oceans"

Carnegie Mellon University, Department of Chemical Engineering, 9-80 to 5-84

Degree: BS, Advisor: Professor E. I. Ko.

Thesis: "Strong Metal-Support Interactions in Heterogeneous Catalysis"

PROFESSIONAL EXPERIENCE:

- Faculty Appointment, Biomechanics and Movement Science (BIOMS) Program, UD, (10/2015-)
- Robert L. Pigford Chaired Professor of Chemical Engineering, 9/14-
- Affiliated Faculty, Department of Physics and Astronomy, UD, 9/14-
- Co-Founder, STF Technologies LLC, 6/2013.
- Chair, Department of Chemical and Biomolecular Engineering, UD 7/07-7/12
- Director, UD Center for Neutron Science, 9/07-present
- Alvin B. and Julia O. Stiles Named Professorship, 9/05-8/14
- Professor, UD, 5/99-9/05
- Visiting Scholar, TU Berlin Chemistry (2012), Physical Chemistry, Lund (2012)
- Visiting Scholar, Dept. of Physics, University of Rome, 6/04-12/04
- Center for Molecular and Engineering Thermodynamics, 5-95 to present
- Fulbright Senior Scholar, Guest Professor-Dept. of Physics, University of Konstanz, Konstanz, Germany (8/97-1/98)
- Guest Professor-Institute for Polymer Physics, Swiss Federal Institute of Technology (ETH), Zürich, Switzerland (1/97-6/97)
- Associate Professor, Department of Chemical Engineering, UD, 5-95 to 5-99
- Assistant Professor, Department of Chemical Engineering, UD, 1-91 to 5-95
- Collaborator, Los Alamos National Laboratory US Department of Energy, 9-86 to 9-93
- Director's Postdoc - Los Alamos National Laboratory, US Department of Energy, 1-90 to 12-90
Theoretical Chemistry and Molecular Physics, Advisor: Dr. Brad Lee Holian
- NATO Postdoctoral Fellow - Fakultät für Physik Universität Konstanz, Germany, 11-88 to 12-89
Mentor: Professor Dr. Rudolf Klein

- Los Alamos National Laboratory, US Department of Energy Grad Intern 6-85 to 8-85
- Pittsburgh Energy Technology Center, US Department of Energy Oak Ridge Associated University Graduate Research Program 6-84 to 8-85 Advisor: Dr. V. Rao
- Chemical Catalysis Laboratory, Carnegie Mellon University, 5-82 to 5-84

Foreign Languages: German, reading and conversation

HONORS, AWARDS AND FELLOWSHIPS:

- Neutron Scattering Society of America's Service Award, 2016
- Elected as Fellow of the National Academy of Inventors, 2015
- Elected to the National Academy of Engineering, 2015
- Fellow, American Association for the Advancement of Science, 2014
- Bingham Medal, Society of Rheology, 2014
- Fellow, Neutron Scattering Society of America, 2014
- AIChE Particle Technology Forum Thomas Baron Award in Fluid Particle Systems, 2013
- Dale Pearson Lectureship, UCSB, May, 2008.
- American Chemical Society Delaware Section Award, 2005.
- Paul A. Siple Memorial Award, , 23rd Army Research Conf., Dec. 2002.
- Upper St. Clair HS Alumni Hall of Fame, Academics, 2002
- Robert W. Vaughan Lectureship, Cal. Inst. Tech., 1998
- Fulbright Senior Scholar Award, 1997
- DuPont Young Faculty Award 1995, 96, 97
- Delta Phi Alpha Honorary Member 1994
- Presidential Young Investigator Award 1991
- Director's Postdoctoral Fellowship, Los Alamos Nat. Lab., 1-90 to 12-90
- NATO/NSF Postdoctoral Fellowship, 11-88 to 12-89
- NSF Graduate Research Fellowship, 9-85 to 9-88
- DuPont Research Fellowship, 9-84 to 9-88
- Tau Beta PI, Lamda Sigma Society 1982
- James J. Kerrigan Scholarship, Merck Co., 9-80 to 5-84

PROFESSIONAL SOCIETIES:

- American Chemical Society
- American Physical Society
- Society of Rheology (Officer- Elected Vice President 2015)
- Materials Research Society
- American Institute of Chemical Engineers
- American Association for the Advancement of Science
- Neutron Scattering Society of America (Officer)
- Delta Phi Alpha (National German Honor Society)
- Fulbright Society Lifetime Member

EDITORIAL BOARDS:

- Associate Editor for Soft Matter, American Institute of Chemical Engineering Journal (2015-)
- Current Opinion in Chemical and Engineering Science (2012-) (Issue Editor: Rheology of Nanoparticles, 2017)
- Journal of Polymer Science Part B: Polymer Physics (2002-2012)
- Journal of Rheology (2005-)

- Rheologica Acta (2001-)
- Section Editor “Techniques”, Current Opinion in Colloid & Interface Science (2001-)

SERVICE:

- Engineering Conferences International “Associations in Solution IV”, St Johns, Canada, July 30-Aug. 4, 2017
- Co-Chair Committee of Visitors, Scientific User Facilities Division, DOE BES August 12-14, 2016
- Reviewer, ORNL SNS/HFIR for DOE BES, August 25-27, 2015
- Chair, UD Faculty Senate Committee on General Education (2014-15)
- Society of Rheology Executive Committee Member at Large (2007-15), Vice President 2015-7
- Neutron Scattering Society of America, Executive Committee Member at Large (2009-)
- Gordon Research Conference on “Colloidal, Macromolecular and Polyelectrolyte Solutions”, 2010 Vice-Chair, 2012 Co-Chair. (elected to the GRC “Hall of Fame”)
- Engineering Conferences International “Associations in Solution III”, Bifrost, Iceland, 2012. Co-Chair.
- International Congress on Rheology 2012, Session Chair “Colloids and Suspensions”
- Society of Rheology Bingham Committee (2006-9)
- AIChE Area 1J Programming Committee (2008-)
- Univ. of Delaware, Chairs’ Caucus Planning Committee (2008-2010)
- Chair, Univ. of Delaware Chairs’ Caucus (2011-2012)
- Symposium Organizer, XVth International Congress of Rheology (2008)
- Session Organizer, ACS National, March 2007
- Organizing Committee for the 2nd Association in Solution Conference, Tomar, Portugal July 2009
- Local Organizing Committee, 2007 ACS Colloids Symposium.

CONSULTING: (past 10 years)

DuPont, TA Instruments, Unilever, DOW, ExxonMobil, Rhodia, Unilever, P&G, Merck, Molyntyke, International Fine Particle Research Institute

PATENTS:

1. **US8834926**, “MACROMOLECULAR DIFFUSION AND RELEASE FROM SELF-ASSEMBLED BETA-HAIRPIN PEPTIDE HYDROGELS”. Inventors: Joel P. Schneider, Monica C. Branco, Darrin J. Pochan, Norman J. Wagner, Published: Sept. 14, 2014, Application number: 12/533,708, Publication number: US 2010/0034881 A1, Filing date: Jul 31, 2009, WO2010017369A2
2. **WO2007100312 (A2)** “CONFORMABLE BALLISTIC RESISTANT AND PROTECTIVE COMPOSITE MATERIALS COMPOSED OF SHEAR THICKENING FLUIDS REINFORCED BY SHORT FIBERS” with Eric Wetzel, EP1858700 A2, Publication date Nov 28, 2007, Filing date Feb 9, 2006, Priority date Feb 9, 2005 Also published as US20090004413, Application number: 11/815,926, Publication number: US 2009/0004413 A1, Filing date: Feb 9, 2006
3. **US 8088443** “EMULSIFICATION OF CONCENTRATED DISPERSIONS OF COLLOIDAL AND NANOPARTICLES” Norman J. Wagner and Caroline H. Nam, Filing date: Sep 30, 2009, Issue date: Jan 3, 2012, Application number: 12/570,664
4. **US 7825045** “ADVANCED BODY ARMOR” with Eric D. Wetzel, Filing date: Feb 13, 2009, Issue date: Nov 2, 2010, Application number: 12/370,669

5. **US 7594429** “SYSTEM AND METHOD FOR IMPROVED OPTICAL MEASUREMENT DURING RHEOMETRIC MEASUREMENTS” with Matthew Liberatore and Peter Foster, Filing date: Nov 22, 2006, Issue date: Sep 29, 2009, Application number: 11/603,087
6. **US 7500385** “SYSTEM FOR IN-SITU OPTICAL MEASUREMENT AND SAMPLE HEATING DURING RHEOMETRIC MEASUREMENTS” with Matthew Liberatore and Peter Foster, Filing date: Nov 22, 2006 Issue date: Mar 10, 2009 Application number: 11/603,086
7. **US 7498276** “ADVANCED BODY ARMOR UTILIZING SHEAR THICKENING FLUIDS” with Eric D. Wetzel, Filing date: May 18, 2004, Issue date: Mar 3, 2009, Application number: 10/557,312
8. **US 7226878 B2** “ADVANCED BODY ARMOR UTILIZING SHEAR THICKENING FLUIDS”, with Eric Wetzel, Filing date: May 19, 2003, Issue date: Jun 5, 2007, Application number: 10/441,655
9. **DE 196 01 695 A1** “DAMPING DETERMINATION IN SUSPENSION OF CHARGED PARTICLES ” with Norbert Willenbacher, BASF AG, 1997,
10. “SHEAR THICKENING FLUID CONTAINMENT IN POLYMER COMPOSITES” U.S. Patent Application Serial # 11/260,742, with John Kirkwood and Ron Egres, Jr. Publication number EP2324909 A2, Publication date May 25, 2011, Filing date Sep 7, 2007, Priority date, Sep 7, 2006, Also published as EP1897609A2, EP 2324910 A2.
11. “DESIGNED PARTICLE AGGLOMERATION” with John Henry Green, Douglas Eric Spahr and Marc Sommer, DUPONT, Application number: 10/882,819, Publication number: US 2005/0106310 A1, Filing date: Jul 1, 2004, also published as EP 1639032 A2 (text from WO2005016506A2)
12. “A METHOD FOR BUILDING STRUCTURE AND VISCOELASTICITY IN SURFACTANT SOLUTIONS BY ADDITION OF NANOPARTICLES” with E.W. Kaler, F. Nettesheim, M.E. Helgeson, M. W. Liberatore, M. W. Vethamuthu, K.P. Ananth, Application number: 12/739,758, Publication number: US 2010/0264364 A1, Filing date: Oct 28, 2008
13. “IMPACT-RESISTANT PAD AND METHOD OF MANUFACTURING” : J. Fowler, K. Zetune, and N.J. Wagner. WO2013039945 US201161534549P 20110914
14. “PUNCTURE AND/OR CUT RESISTANT GLOVE HAVING MAXIMIZED DEXTERITY, TACTILITY, AND COMFORT” : Inventors: K. Zetune, R. Dombrowski, J. Day, N.J. Wagner. US2013139294 Application number: US201113639740 20110407 Also published as: WO2011127259 (A2) WO2011127259 (A3) EP2555643 (A2)
15. Lopez-Barron C, Chen R, Wagner NJ, inventors; University of Delaware, assignee. Cross-Linked Ionoelastomers With Outstanding Tensile Responses and High Ion Conductivity. US2016 12-Sept. 2016.
16. Xu K, Wagner NJ, inventors; University of Delaware, assignee. Transtibial Prosthesis With Passive Variable Ankle Stiffness. US 2016 22-August 2016.

PUBLICATIONS:

Books:

1. Mass and Heat Transfer: Analysis of Mass Contactors and Heat Exchangers, with TWF Russel and AS Robinson, Cambridge University Press, Cambridge, 2008. Second printing 2012. ISBN-13: 9780521886703 www.mht.che.udel.edu
2. Colloidal Suspension Rheology, with J. Mewis (KU Leuven), Cambridge University Press, Cambridge, 2011 (hardback), 2012 (paperback). ISBN 978-0-521-51599-3 <http://sites.udel.edu/csr/>
3. Colloidal Suspension Rheology: Theory and Applications, with J. Mewis (KU Leuven), Cambridge University Press, in progress (expected 2018).

Invited Book Chapters:

1. Chapter 33, **Mentee's Sharing**, in *Mentoring Mentors*, Edmond Ko, City University of Hong Kong Press, 2005.
2. *New insights from Rheo-SANS* by Michelle A. Calabrese and Norman J. Wagner. Chapter 8 in *Wormlike micelles: systems, characterization and applications*, Cecile Dreiss & Yujun Feng editors, Royal Society of Chemistry, 2017.
3. *Self-assembly of block copolymers in ionic liquids* by Ru Chen, Carlos Lopez-Barron, and Norman J. Wagner. *Ionic Liquids: Current State and Future Directions*, Aaron M. Scurto and Mark B. Shiflett, ACS Books, to appear 2017.

Editorial Overviews:

1. "Proceedings of the Boston Symposia on Experimental-Techniques", with W.R. Burghardt, *Journal of Rheology* 1994, 38, (4), 1069-1069.
2. "Rheology and Rheological Techniques," with R.K. Prud'homme, *Current Opinion in Coll. Int. Sci.*, 6, 421-422 (2001).
3. "Techniques/scattering", L. Magid, J. Penfold, P. Schurtenberger and N. Wagner *Current Opinion in Colloid & Interface Science*, 7(3-4), 193-195, (2002)
4. "Experimental Techniques/scattering", L. Magid, J. Penfold, P. Schurtenberger and N. Wagner *Current Opinion in Colloid & Interface Science*, 8, 491-493 (2004)
5. "Experimental Techniques/scattering", L. Magid, J. Penfold, P. Schurtenberger and N. Wagner *Current Opinion in Colloid & Interface Science*, (2007)
6. "Viewpoint: How colloidal dispersions relax under stress" N. Wagner, *Physics* 1, 22 (2008) doi:10.1103/Physics.1.22
7. "The Future of Suspension RheoPhysics: Comments on the 2008 Workshop", N.J. Wagner and P. Coussot, *Rheologica Acta*, 48(8) 827-829 (2009).
8. "Scattering Techniques, 2012" J. Penfold, N. Wagner and P. Schurtenberger, *Current Opinion in Colloid & Interface Science* 17(1) 1-2 (2012).
9. "Editorial for 2015 X-ray, neutron and light scattering section of COCIS", Jeff Penfold, Peter Schurtenberger, Norman Wagner, *Current Opinion in Colloid & Interface Science*, 20(4) 213-214 (2014)
10. "Meeting Report: The 8th American Conference on Neutron Scattering" by Mark. D. Lumsdon, Jamie A. Fernandez-Baca, Mathew E. Helgeson, Ronald L. Jones, Jeffrey W. Lynn, Katherine Page, Gregory S. Smith, Matthew Tucker & Norman J. Wagner, *Neutron News*, 27(4) (2016).

Invited Review Articles:

11. "Rheo-Optics", N.J. Wagner, *Current Opinion in Colloid and Interface Sci.*, 3(4), 391-400, 1998.
12. "The role of nanoscale forces on colloid dispersion rheology", Norman J. Wagner & Jonathan W. Bender, *MRS Bulletin "New Developments in Colloid Science"*, 29(2), 100-106 (2004).
13. "Shear Thickening Fluids", with J.F. Brady, in preparation for *Phys. Today*, 2009.
14. "Rheo-SANS: Gap-Resolved SANS of Shear-Induced Alignment of Wormlike Micelles", M Liberatore, F. Nettesheim, N.J. Wagner and L. Porcar, 2005 Accomplishments and Opportunities, NIST NCNR. p. 18-19.
15. "Current Trends in Suspension Rheology," Jan Mewis and Norman J. Wagner, *JNNFM*, 157:147-150, 2009, p. 42-43.
16. "Constitutive Modeling and Spatially Resolved Structure of CTAB Wormlike Micelles Through the Shear Banding Transition," M. E. Helgeson and N. J. Wagner, 2008 Accomplishments and Opportunities, NIST NCNR, p. 42-43.

17. "Dynamics and structure of semiflexible, self-assembled peptide chain networks." M.C. Branco, J.P. Schneider, D.J. Pochan, N.J. Wagner, 2009 Accomplishments and Opportunities, NIST NCNR, p. 42-43.
18. "Neutron transmission measurements of concentration profiles in non-homogeneous shear flows." M.E. Helgeson, N.J. Wagner and L. Porcar, 2010 Accomplishments and Opportunities, NIST NCNR p. 38-39.
19. "Neutron Scattering Techniques shed new light on gel formation." A.P.R. Eberle, N.J. Wagner, R. Castaneda-Priego, 2011 Accomplishments and Opportunities, NIST, NCNR p. 36-37.
20. "A shear cell designed to probe the velocity-velocity gradient (1-2) plane of shear in complex fluids." A.K. Gurnon, P.D. Godfrin, N.J. Wagner, C. Lopez-Barron, A.P.R. Eberle, P. Butler, C. Gagnon, L. Porcar, 2013 Accomplishments and Opportunities, NIST, NCNR, p. 46.
21. "Rheology of Branched Wormlike Micelles." Simon A. Rogers, Michelle A. Calabrese, and Norman J. Wagner, 2014, *Current Opinion in Colloid and Interface Science – Rheology*, 19, pp. 530-535.

Publications in refereed journals: (ISI researcher ID# B-6558-2012: 263 of 274 publications citable, h-index: 48, 7660 citations). **(1–250)(251–265)**

1. Ko EI, Hupp JM, Rogan FH, Wagner NJ. PREPARATION, REDUCTION, AND CHEMISORPTION BEHAVIOR OF NIOBIA-SUPPORTED NICKEL-CATALYSTS. *Journal of Catalysis*. 1983;84(1):85-94.
2. Ko EI, Hupp JM, Wagner NJ. ACTIVITY AND SELECTIVITY OF A NIOBIA (NB2O5)-SUPPORTED NICKEL-CATALYST IN CO HYDROGENATION. *Journal of the Chemical Society-Chemical Communications*. 1983(2):94-5.
3. Bafrali RM, Wagner NJ, Ko EI. SYNTHESIS AND CHARACTERIZATION OF A SURFACE PHASE OXIDE SYSTEM AS A CATALYST SUPPORT. *Abstracts of Papers of the American Chemical Society*. 1984;187(APR):70-COLL.
4. Ko EI, Hupp JM, Wagner NJ. ETHANE HYDROGENOLYSIS AND CARBON-MONOXIDE HYDROGENATION OVER NIOBIA-SUPPORTED NICKEL-CATALYSTS - A HIERARCHY TO RANK STRONG METAL-SUPPORT INTERACTION. *Journal of Catalysis*. 1984;86(2):315-27.
5. Ko EI, Wagner NJ. EVIDENCE OF METAL SUPPORT INTERACTION FOR AN NI/TIO2-SIO2 CATALYST. *Journal of the Chemical Society-Chemical Communications*. 1984(19):1274-5.
6. Ko EI, Bafrali R, Nuhfer NT, Wagner NJ. THE USE OF A NIOBIA-SILICA SURFACE PHASE OXIDE IN STUDYING AND VARYING METAL SUPPORT INTERACTIONS IN SUPPORTED NICKEL-CATALYSTS. *Journal of Catalysis*. 1985;95(1):260-70.
7. Wagner NJ, Fuller GG, Russel WB. THE DICHROISM AND BIREFRINGENCE OF A HARD-SPHERE SUSPENSION UNDER SHEAR. *Journal of Chemical Physics*. 1988;89(3):1580-7.
8. Ackerson BJ, Dekruif CG, Wagner NJ, Russel WB. COMPARISON OF SMALL SHEAR-FLOW RATE SMALL WAVE VECTOR STATIC STRUCTURE FACTOR DATA WITH THEORY. *Journal of Chemical Physics*. 1989;90(6):3250-3.
9. Graham AL, Mondy LA, Miller JD, Wagner NJ, Cook WA. NUMERICAL SIMULATIONS OF ECCENTRICITY AND END EFFECTS IN FALLING BALL RHEOMETRY. *Journal of Rheology*. 1989;33(7):1107-28.
10. Wagner NJ, Russel WB. NONEQUILIBRIUM STATISTICAL-MECHANICS OF CONCENTRATED COLLOIDAL DISPERSIONS - HARD-SPHERES IN WEAK FLOWS

WITH MANY-BODY THERMODYNAMIC INTERACTIONS. *Physica A*. 1989;155(3):475-518.

11. Wagner NJ, Russel WB. LIGHT-SCATTERING MEASUREMENTS OF A HARD-SPHERE SUSPENSION UNDER SHEAR. *Physics of Fluids a-Fluid Dynamics*. 1990;2(4):491-502.

12. Holian BL, Voter AF, Wagner NJ, Ravelo RJ, Chen SP, Hoover WG, et al. EFFECTS OF PAIRWISE VERSUS MANY-BODY FORCES ON HIGH-STRESS PLASTIC-DEFORMATION. *Physical Review A*. 1991;43(6):2655-61.

13. Wagner NJ. THE BIREFRINGENCE OF SHEARING COLLOIDAL SUSPENSIONS. *Journal of Chemical Physics*. 1991;94(10):6931-2.

14. Wagner NJ. THE STRUCTURE AND RHEOLOGY OF POLYDISPERSE, CHARGED COLLOIDAL SUSPENSIONS. Abstracts of Papers of the American Chemical Society. 1991;202:165-COLL.

15. Wagner NJ, Krause R, Rennie AR, Daguanno B, Goodwin J. THE MICROSTRUCTURE OF POLYDISPERSE, CHARGED COLLOIDAL SUSPENSIONS BY LIGHT AND NEUTRON-SCATTERING. *Journal of Chemical Physics*. 1991;95(1):494-508.

16. Wagner NJ, Ackerson BJ. ANALYSIS OF NONEQUILIBRIUM STRUCTURES OF SHEARING COLLOIDAL SUSPENSIONS. *Journal of Chemical Physics*. 1992;97(2):1473-83.

17. Wagner NJ, Holian BL, Voter AF. MOLECULAR-DYNAMICS SIMULATIONS OF 2-DIMENSIONAL MATERIALS AT HIGH-STRAIN RATES. *Physical Review A*. 1992;45(12):8457-70.

18. Johnson CA, Wu P, Lenhoff AM, Wagner NJ. ELECTROSTATIC AND VANDERWAALS CONTRIBUTIONS TO THE FORMATION OF ORDERED ARRAYS OF ADSORBED PARTICLES. Abstracts of Papers of the American Chemical Society. 1993;205:217-COLL.

19. Wagner NJ. THE HIGH-FREQUENCY SHEAR MODULUS OF COLLOIDAL SUSPENSIONS AND THE EFFECTS OF HYDRODYNAMIC INTERACTIONS. *Journal of Colloid and Interface Science*. 1993;161(1):169-81.

20. Bergenholtz J, Wagner NJ. THE HUGGINS COEFFICIENT FOR THE SQUARE-WELL COLLOIDAL FLUID. *Industrial & Engineering Chemistry Research*. 1994;33(10):2391-7.

21. Wagner NJ. SELF-CONSISTENT SOLUTION FOR THE GENERALIZED HYDRODYNAMICS MODEL OF SUSPENSION DYNAMICS - COMPARISON OF THEORY WITH RHEOLOGICAL AND OPTICAL MEASUREMENTS. *Physical Review E*. 1994;49(1):376-401.

22. Wagner NJ, Burghardt WR. PROCEEDINGS OF THE BOSTON SYMPOSIA ON EXPERIMENTAL-TECHNIQUES. *Journal of Rheology*. 1994;38(4):1069-.

23. Wagner NJ, Walker LM. DETERMINATION OF THE TEXTURE VISCOSITY AND ELASTICITY OF A NEMATIC PBLG D-DMF SOLUTION THROUGH MAGNETIC-FIELD ALIGNMENT. *Macromolecules*. 1994;27(21):5979-86.

24. Wagner NJ, Woutersen A. THE VISCOSITY OF BIMODAL AND POLYDISPERSE SUSPENSIONS OF HARD-SPHERES IN THE DILUTE LIMIT. *Journal of Fluid Mechanics*. 1994;278:267-87.

25. Walker LM, Wagner NJ. RHEOLOGY OF LIQUID-CRYSTALLINE POLYMERS, REGION I FLOW. Abstracts of Papers of the American Chemical Society. 1994;208:248-PMSE.

26. Walker LM, Wagner NJ. TEST OF THE RANDOM-PHASE-APPROXIMATION FOR ISOTROPIC SOLUTIONS OF RIGID MACROMOLECULES BY SANS. Abstracts of Papers of the American Chemical Society. 1994;208:159-PMSE.
27. Walker LM, Wagner NJ. VERIFICATION OF A TEXTURE-BASED MODEL FOR FLOWING LIQUID-CRYSTALLINE POLYMERS THROUGH SMALL-ANGLE LIGHT-SCATTERING. Abstracts of Papers of the American Chemical Society. 1994;208:182-PMSE.
28. Bender JW, Wagner NJ. OPTICAL MEASUREMENT OF THE CONTRIBUTIONS OF COLLOIDAL FORCES TO THE RHEOLOGY OF CONCENTRATED SUSPENSIONS. *Journal of Colloid and Interface Science*. 1995;172(1):171-84.
29. Bergholtz J, Romagnoli AA, Wagner NJ. VISCOSITY, MICROSTRUCTURE, AND INTERPARTICLE POTENTIAL OF AOT/H₂O/N-DECANE INVERSE MICROEMULSIONS. *Langmuir*. 1995;11(5):1559-70.
30. Rastogi SR, Wagner NJ. MASSIVELY-PARALLEL NONEQUILIBRIUM BROWNIAN DYNAMICS SIMULATIONS FOR COMPLEX FLUIDS - THE RHEOLOGY OF BROWNIAN SUSPENSIONS. *Computers & Chemical Engineering*. 1995;19(6-7):693-718.
31. Wagner NJ, Walker LM, Hammouda B. STRUCTURE OF ISOTROPIC SOLUTIONS OF RIGID MACROMOLECULES VIA SMALL-ANGLE NEUTRON-SCATTERING - POLY(GAMMA-BENZYL L-GLUTAMATE)/DEUTERATED DIMETHYLFORMAMIDE. *Macromolecules*. 1995;28(14):5075-81.
32. Walker LM, Wagner NJ, Larson RG, Mirau PA, Moldenaers P. THE RHEOLOGY OF HIGHLY CONCENTRATED PBLG SOLUTIONS. *Journal of Rheology*. 1995;39(5):925-52.
33. Bender J, Wagner NJ. Reversible shear thickening in monodisperse and bidisperse colloidal dispersions. *Journal of Rheology*. 1996;40(5):899-916.
34. Bergholtz J, Wagner NJ. Formation of AOT/brine multilamellar vesicles. *Langmuir*. 1996;12(13):3122-6.
35. Bergholtz J, Wagner NJ, Daguanno B. Thermodynamic self-consistency criterion in the mixed integral equation theory of liquid structure. *Physical Review E*. 1996;53(3):2968-71.
36. Bergholtz J, Wu P, Wagner NJ, Daguanno B. HMSA integral equation theory for the square-well fluid. *Molecular Physics*. 1996;87(2):331-46.
37. Butera RJ, Wolfe MS, Bender J, Wagner NJ. Formation of a highly ordered colloidal microstructure upon flow cessation from high shear rates. *Physical Review Letters*. 1996;77(10):2117-20.
38. Butera RJ, Wolfe MS, Bender JW, Wagner NJ. Shear thickening in an electrostatically stabilized colloidal suspension relaxation from the shear thickened state. Abstracts of Papers of the American Chemical Society. 1996;212:300-PMSE.
39. Kotelyanskii M, Wagner NJ, Paulaitis ME. Building large amorphous polymer structures: Atomistic simulation of glassy polystyrene. *Macromolecules*. 1996;29(26):8497-506.
40. Rastogi SR, Wagner NJ. A parallel algorithm for Lees-Edwards boundary conditions. *Parallel Computing*. 1996;22(6):895-901.
41. Rastogi SR, Wagner NJ, Lustig SR. Microstructure and rheology of polydisperse, charged suspensions. *Journal of Chemical Physics*. 1996;104(22):9249-58.
42. Rastogi SR, Wagner NJ, Lustig SR. Rheology, self-diffusion, and microstructure of charged colloids under simple shear by massively parallel nonequilibrium Brownian dynamics. *Journal of Chemical Physics*. 1996;104(22):9234-48.

43. RiveraGastelum MJ, Wagner NJ. A rheological and morphological study of a copolyester liquid crystal polypropylene blend system. *Journal of Polymer Science Part B-Polymer Physics*. 1996;34(14):2433-45.
44. Walker LM, Wagner NJ. SANS analysis of the molecular order in poly(γ -benzyl L-glutamate) deuterated dimethylformamide (PBLG/d-DMF) under shear and during relaxation. *Macromolecules*. 1996;29(6):2298-301.
45. Bergholtz J, Wagner NJ. Self-diffusion in dispersions of charged colloidal spheres by generalized hydrodynamics. *Physica A*. 1997;235(1-2):34-47.
46. Cuthbert TR, Wagner NJ, Paulaitis ME. Molecular simulation of glassy polystyrene: Size effects on gas solubilities. *Macromolecules*. 1997;30(10):3058-65.
47. Cuthbert TR, Wagner NJ, Paulaitis ME. Simulation of small molecule diffusion in glassy polypropylene: Size effects as probed by a force-decomposition parallel algorithm. *Abstracts of Papers of the American Chemical Society*. 1997;213:115-COMP.
48. Oberholzer MR, Wagner NJ, Lenhoff AM. Grand canonical Brownian dynamics simulation of colloidal adsorption. *Journal of Chemical Physics*. 1997;107(21):9157-67.
49. Rastogi SR, Wagner NJ. Quantitative predictions of suspension rheology by nonequilibrium Brownian dynamics and hydrodynamic preaveraging. *Journal of Rheology*. 1997;41(4):893-9.
50. Wagner NJ, Ottinger HC. Accurate simulation of linear viscoelastic properties by variance reduction through the use of control variates. *Journal of Rheology*. 1997;41(3):757-68.
51. Walker LM, Kernick WA, Wagner NJ. In situ analysis of the defect texture in liquid crystal polymer solutions under shear. *Macromolecules*. 1997;30(3):508-14.
52. Bergholtz J, Horn FM, Richtering W, Willenbacher N, Wagner NJ. Relationship between short-time self-diffusion and high-frequency viscosity in charge-stabilized dispersions. *Physical Review E*. 1998;58(4):R4088-R91.
53. Bergholtz J, Willenbacher N, Wagner NJ, Morrison B, van den Ende D, Mellema J. Colloidal charge determination in concentrated liquid dispersions using torsional resonance oscillation. *Journal of Colloid and Interface Science*. 1998;202(2):430-40.
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242. Lopez-Barron CR, Wagner NJ, Porcar L. Layering, melting, and recrystallization of a close-packed micellar crystal under steady and large-amplitude oscillatory shear flows. *Journal of Rheology*. 2015;59(3):793-820.
243. Armstrong MJ, Beris AN, Rogers SA, Wagner NJ. Dynamic shear rheology of a thixotropic suspension: Comparison of an improved structure-based model with large amplitude oscillatory shear experiments. *Journal of Rheology*. 2016;60(3):433-50.

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245. Calabrese MA, Rogers SA, Porcar L, Wagner NJ. Understanding steady and dynamic shear banding in a model wormlike micellar solution. *Journal of Rheology*. 2016;60(5):1001-17.
246. Calabrese MA, Wagner NJ, Rogers SA. An optimized protocol for the analysis of time-resolved elastic scattering experiments. *Soft Matter*. 2016;12(8):2301-8.
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248. Cwalina CD, McCutcheon CM, Dombrowski RD, Wagner NJ. Engineering enhanced cut and puncture resistance into the thermal micrometeoroid garment (TMG) using shear thickening fluid (STF) - Armor (TM) absorber layers. *Composites Science and Technology*. 2016;131:61-6.
249. Cwalina CD, Wagner NJ. Rheology of non-Brownian particles suspended in concentrated colloidal dispersions at low particle Reynolds number. *Journal of Rheology*. 2016;60(1):47-59.
250. Gao JS, Wagner NJ. Water Nanocluster Formation in the Ionic Liquid 1-Butyl-3-methylimidazolium Tetrafluoroborate (C(4)mim BF₄)-D₂O Mixtures. *Langmuir*. 2016;32(20):5078-84.
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254. Greene DG, Ferraro DV, Lenhoff AM, Wagner NJ. A critical examination of the decoupling approximation for small-angle scattering from hard ellipsoids of revolution. *Journal of Applied Crystallography*. 2016;49:1734-9.
255. Lopez-Barron CR, Chen R, Wagner NJ. Ultrastretchable Iono-Elastomers with Mechanoelectrical Response. *Acs Macro Letters*. 2016;5(12):1332-8.
256. Lopez-Barron CR, Chen R, Wagner NJ, Beltramo PJ. Self-Assembly of Pluronic F127 Diacrylate in Ethylammonium Nitrate: Structure, Rheology, and Ionic Conductivity before and after Photo-Cross-Linking. *Macromolecules*. 2016;49(14):5179-89.
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258. Mwasame PM, Wagner NJ, Beris AN. Modeling the viscosity of polydisperse suspensions: Improvements in prediction of limiting behavior. *Physics of Fluids*. 2016;28(6).
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260. Richards JJ, Scherbarth AD, Wagner NJ, Butler PD. Mixed Ionic/Electronic Conducting Surface Layers Adsorbed on Colloidal Silica for Flow Battery Applications. *Acs Applied Materials & Interfaces*. 2016;8(36):24089-96.
261. Swan JW, Gurnon AK, Wagner NJ. The medium amplitude oscillatory shear of semidilute colloidal dispersions. Part II: Third harmonic stress contribution. *Journal of Rheology*. 2016;60(2):241-55.

262. Gordon MB, Kloxin CJ, Wagner NJ. The rheology and microstructure of an aging thermoreversible colloidal gel. *Journal of Rheology*. 2017;61(1):23-34.
263. Koshari SHS, Ross JL, Nayak PK, Zarraga IE, Rajagopal K, Wagner NJ, et al. Characterization of Protein-Excipient Microheterogeneity in Biopharmaceutical Solid-State Formulations by Confocal Fluorescence Microscopy. *Molecular Pharmaceutics*. 2017;14(2):546-53.
264. Mwasame PM, Beris AN, Diemer RB, Wagner NJ. A constitutive equation for thixotropic suspensions with yield stress by coarse-graining a population balance model. *Aiche Journal*. 2017;63(2):517-31.
265. Park JD, Ahn KH, Wagner NJ. Structure-rheology relationship for a homogeneous colloidal gel under shear startup. *Journal of Rheology*. 2017;61(1):117-37.

Conference Papers:

1. Y. S. Lee, E. D. Wetzel, R. G. Egres Jr., and N. J. Wagner, "Advanced Body Armor Utilizing Shear Thickening Fluids," in *Proceedings of the 23rd Army Science Conference*, (Orlando, FL, December 2-5, 2002).
2. R. G. Egres Jr., Y. S. Lee, J. E. Kirkwood, K. M. Kirkwood, E. D. Wetzel and N. J. Wagner, "Novel Flexible Body Armor Utilizing Shear Thickening Fluid (STF) Composites," in *Proceedings of the 14th International Conference on Composite Materials*, (San Diego, CA, July 14-18, 2003).
3. E. D. Wetzel, Y. S. Lee, R. G. Egres Jr., K. M. Kirkwood, J. E. Kirkwood, and N. J. Wagner, "The Effect of Rheological Parameters on the Ballistic Properties of Shear Thickening Fluid (STF)-Kevlar Composites," in *Proceedings of the 8th International Conference on Numerical Methods in Industrial Forming Processes*, Columbus, OH, June 13-17, 2004).
4. R. G. Egres and N. J. Wagner, "The Rheology and Rheo-SANS Microstructure Analysis of Shear Thickening Acicular Precipitated Calcium Carbonate Dispersions." in *Proceedings of the XIVth International Congress on Rheology*, (Seoul, South Korea, August 22-27, 2004).
5. R. G. Egres Jr, Y. S. Lee, J. E. Kirkwood, K. M. Kirkwood, E. D. Wetzel, N. J. Wagner, "Liquid Armor: Protective Fabrics Utilizing Shear Thickening Fluids," in *Proceedings of the 4th International Conference on Safety and Protective Fabrics*, (Pittsburgh, PA, October 26-27, 2004).
6. R. G. Egres Jr., M. J. Decker, C. J. Halbach, Y. S. Lee, J. E. Kirkwood, K. M. Kirkwood, E. D. Wetzel, N. J. Wagner, "Stab Resistance of Shear Thickening Fluid (STF)-Kevlar Composites for Body Armor Applications," in *Proceedings of the 24th Army Science Conference*, (Orlando, FL, November 29-December 2, 2004).
7. R. G. Egres, C. J. Halbach, M. J. Decker, E. D. Wetzel, and N. J. Wagner, "Stab Performance of STF-Fabric Composites for Body Armor Applications," in *Proceedings of the Society for the Advancement of Material and Process Engineering Conference*, (Long Beach, CA, May 1-5, 2004).
8. C. H. Nam, M. J. Decker, C. J. Halbach, E. D. Wetzel, and N. J. Wagner, "Ballistic and Rheological Properties of STFs Reinforced by short Discontinuous Fibers," in *Proceedings of the Society for the Advancement of Material and Process Engineering Conference*, (Long Beach, CA, May 1-5, 2004).
9. Nam, C. H., Wagner, N. J., Thixotropy and Shear-Induced Microstructure of Shear Thickening, Nanoaggregate, Fumed Silica Dispersions and Nam, C. H., Wetzel, E. D., Wagner, N. J., Ballistic and Rheological Properties of Shear Thickening Fluids Reinforced By Short Discontinuous

- Fibers, American Institute of Chemical Engineers Annual Meeting, Cincinnati, OH, November 2005.
10. "Ballistic and Rheological Properties of Shear Thickening Fluids Reinforced by Short Discontinuous Fibers and Stab Performance of Shear Thickening Fluid Fabric Composites for Body Armor Applications" Caroline H. Nam, Matthew J. Decker, Christopher Halbach, Eric D. Wetzel, and Norman J. Wagner Society for Advancement of Material and Process Engineering Conference, Long Beach, CA, May 2005.
 11. "Protective fabrics utilizing shear thickening fluids", R. G. Egres Jr., Y.S. Lee, J. E. Kirkwood, K. M Kirkwood, E. D. Wetzel, N. J. Wagner, NDIA, 22nd International Symposium on Ballistics, Vancouver, CA, Nov. 2005.
 12. "Stab Performance of Shear Thickening Fluid (STF)-Fabric Composites for Body Armor Applications" R. G. Egres Jr., C. J. Halbach, M. J. Decker, E. D. Wetzel, and N. J. Wagner, Proceedings of SAMPE 2005: New Horizons for Materials and Processing Technologies. Long Beach, CA. 1-5 May 2005.
 13. "Hypodermic Needle Puncture of Shear Thickening Fluid (STF)-Treated Fabrics," by J. M. Houghton, B. A. Schiffman, D. P. Kalman, E. D. Wetzel, and N. J. Wagner, Proceedings of SAMPE, 2007, Baltimore MD.
 14. "Polymer Dispersion Based Shear Thickening Fluid-Fabrics for Protective Applications." D. P. Kalman, J. B. Schein, J. M. Houghton, C. H. N. Laufer, E. D. Wetzel and N. J. Wagner, Proceedings of SAMPE, 2007, Baltimore MD.
 15. "Multi-threat Performance of Kaolin-based Shear Thickening Fluid (STF)-treated fabrics." Brian A. Rosen, Caroline H. Nam Laufer, Dennis P. Kalman, Eric D. Wetzel, and Norman J. Wagner, Proceedings of SAMPE, 2007, Baltimore MD.
 16. "Kinematic Studies of Polymer Electrospinning using in situ measurements." Matthew E. Helgeson, Kristie N. Grammatikos, Joseph M. Dietzel, Norman J. Wagner, Proceedings of SAMPE, 2007, Baltimore MD.
 17. "Formation and Mechanics of Electrospun Polymer Jests." Matthew E. Helgeson, Kristie N. Grammatikos, Joseph M. Deitzel and Norman J. Wagner, ACS POLY Division, ACS National Meeting, Chicago, March. 2007.
 18. "Simultaneous light scattering-rheology measurements for studying stress induced phase transitions," Aadil Elmoumni, Aloyse J. Franck, Matthew E. Helgeson, Matthew D. Reichert, Jason M. McMullan, Norman J. Wagner, Proceedings of the XVth International Congress of Rheology, Monterey, August, 2008.
 19. "Spatially-resolved microstructure in shear banding wormlike micellar solutions", Matthew E. Helgeson, Matthew D. Reichert, Norman J. Wagner, Eric W. Kaler, Proceedings of the XVth International Congress of Rheology, Monterey, August, 2008.
 20. "Effects of particle hardness on shear thickening colloidal suspension rheology", Dennis P. Kalman, Brian A. Rosen, Norman J. Wagner, Proceedings of the XVth International Congress of Rheology, Monterey, August, 2008.
 21. "Measurement of Needle Puncture Resistance Using an Electrical Puncture Detection System." Richard D. Dombrowski and Norman J. Wagner, *Proceedings of SAMPE 2012*. Baltimore, MD. May 21-24, 2012
 22. "MMOD puncture resistance of EVA suits with shear thickening fluid (STF) – ArmorTM absorber layers," Colin D. Cwalina, Richard D. Dombrowski, Charles J. McCutcheon, Eric L. Christiansen, and Norman J. Wagner, Proceedings of the 13th Hypervelocity Impact Symposium, Denver Colorado, April, 2015.

INVITED NAMED LECTURES AND PLENARY CONFERENCE PRESENTATIONS:

1. European Colloid and Interface Science (ECIS97), Keynote Lecture on *Colloidal Rheology*, Sept., 1997 (Lunteren Netherlands).
2. 1998 Vaughan Lecturer, California Institute of Technology, April, 1998.
3. 13th US National Congress of Applied Mechanics, Gainesville, FL, *Suspension Rheology*, June, 1998.
4. 13th European Colloid and Interface Society Meeting, Dublin Ireland, *Rheology of Concentrated Colloidal Dispersions*, Sept., 1999.
5. Particles 2001, ACS, "The Rheology of Dense Colloidal Dispersions: Shear Thickening, Dilatancy and the Effects of Adsorbed Polymer", Feb. 2001, Orlando FL.
6. PPG Lecture, School of Engineering and Applied Science, Harvard, Oct. 2001
7. American Conference on Neutron Scattering (ACNS), "RHEO-SANS Nonequilibrium Microstructure of Shearing Colloidal Dispersions," Knoxville, TN, June 2002.
8. PSA2003, Particle Systems Analysis 2003, Harrogate, England, Sept. 2003. "Concentrated Dispersion Rheology: Engineering Colloidal Interactions to Control Reversible Shear Thickening."
9. AIChE National Meeting, San Francisco 2003 "Modeling Configurational Diffusion in Polymers Confined in Nanoporous Media and Nanoporous Carbons"
10. APS National March, Montreal, 2004, DCP special session on multiscale modeling. "Modeling Configurational Diffusion in Polymers Confined in Nanoporous Media and Nanoporous Carbons"
11. Gordon Research Conference on Granular Materials, June 2004, "The Rheology of Dense Particle Suspensions"
12. Juelich Condensed Matter School, "Shear Thickening and The Rheology of Dense Particle Suspensions", Netherlands, Nov. 2004.
13. North American Lectures in Chemical Engineering and Materials Science, Univ. Autonoma de San Luis Potosi and Universidad de Guanajuato, , Jan. 06.
14. ICSCS 12th International Conference on Surface and Colloid Science, Keynote Lecture: "Shear Thickening Colloidal Dispersions", Beijing, China, Oct. 2006.
15. AIChE National Meeting, Area 1A, Novel Flows, "Shear Thickening Colloidal Dispersions, Flow Jamming at High Stresses & Applications in Ballistic, Stab & Puncture Threat Mitigation" San Francisco, Nov. 2006.
16. Society of Plastics Engineers, ANTEC 2007m, Plenary Lecture: "'STF Armor': Nanoparticle Composite Textiles and Performance Plastics for Flexible Ballistic & Puncture-Protective Materials", Cincinnati OH, May 2007.
17. 8th International Symposium on Applied Rheology, "Shear Thickening Colloidal Dispersions", Korea University Applied Rheology Center, Seoul, Korea, May, 2007
18. SOCOBIM, Soft, Complex, and Biological Matter Conference, Satellite Conference of IUPAP Statphys 23, "Shear-induced organization in colloidal dispersions: The hydrocluster microstructure in shear thickened colloidal suspensions," Palermo, Sicily, July 2007.
19. Workshop on Rheophysics, "Shear-induced organization in colloidal dispersions: The hydrocluster microstructure in shear thickened colloidal suspensions." Ecole Polytechnique, Ecole des Ponts, Paris, Jan., 2008
20. 2008 Dale Pearson Lectureship, "The Rheology of Colloidal & Nanoparticle Dispersions: 'STF-Armor- Nanoparticle Composites for Flexible Ballistic Materials.'" And "A Tale of Two Surfactants: Structure and Rheology of Shear-banding Wormlike Micellar Solutions." UCSB, May 2008.
21. Society of Rheology Annual Meeting, Plenary Lecture "Microstructure and rheology relationships for concentrated colloidal dispersions: Shear thickening fluids and their applications." Madison, WI, Oct. 2009.

22. American Conference on Neutron Scattering, Keynote Lecture: "Understanding Viscoelastic Self-Assembled Surfactant Micelles and Peptide Hydrogels by Rheo-SANS and NSE.", Ottawa, CA 2010.
23. AERC (Annual European Rheology Conference), Plenary Lecture: "Microstructure & rheology of shear banding and shear induced phase separating wormlike micellar solutions" Suzdal, Russia, 2010.
24. Canadian Society of Rheology Annual Meeting, Keynote Lecture: "Microstructure & rheology of shear banding and shear induced phase separating wormlike micellar solutions." Montreal, June 2011.
25. 86th ACS Colloid and Surface Science Symposium, Keynote Lecture: "Development of microstructure/rheology relationships for complex fluids: Rheo-SALS, time resolved flow-SANS in the 1-2 plane, & tOR-SANS applied to understand steady and transient flows in polymer-like micelles." Johns Hopkins Univ. June, 2012.
26. Brazilian Society of Rheology Plenary Lecture: "How do Gels Shear?" Rio de Janeiro, Brazil, July 2013.
27. White House Office of Science and Technology Policy "We the Geeks: The Stuff Superheroes are Made Of" Google Hangout online: <http://youtu.be/aAOzXYRr8io>, Sept. 2013
28. AIChE National Meeting, Thomas Baron Award Lecture: "Shear Thickening & Gelation in Colloidal Dispersions - Nonequilibrium States and Their Applications in Personal Protective Equipment", San Francisco, Nov. 2013.
29. Smithsonian Associates: "Going to Extremes: The Protective Powers of High Tech Materials", Washington D.C., January 2014
30. Lindsay Lecture, Texas A&M University, February 2014.
31. American Conference on Neutron Scattering (ACNS), "Spatiotemporal SANS measurements of microstructure evolution in dynamically sheared polymer-like micellar solutions." Knoxville, TN June 2014.
32. Bingham Medal Lecture, 86th Society of Rheology Meeting, Philadelphia, PA, October, 2014.
33. Bird/Stewart/Lightfoot Lecture, "How do Gels Form and Flow", University of Wisconsin, Madison, WI, May, 2015.
34. American Physical Society March Meeting, "Material properties of the shear-thickened state in concentrated near hard-sphere colloidal dispersions." San Antonio, TX, March, 2015
35. IACIS & 47th Conference of the German Colloid Society, "Shear thickening fluids and their application in personal protective equipment and space exploration." Mainz, Germany, May, 2015.
36. International Conference on Small Angle Scattering (www.sas2015.org) "Understanding the rheology of complex fluids through flow and rheo-SANS," Berlin, Germany, 13.-18. September 2015.
37. RHEO-SAS Workshop, "Insights into the flow of Complex Fluids using Rheo-SANS" Institut-Laue Langevin, Grenoble, FR. Sept. 2017.
38. Distinguished Chemical Engineering Lecturer, School for Engineering of Matter, Transport and Energy, Arizona State University, "The micromechanics of shear thickening fluids and their application as protective materials for medical professionals, first responders, football players, astronauts and spacecraft." March 27, 2017, Phoenix AZ.

INVITED LECTURES:**Universities, Institutes and Conferences**

1. Los Alamos Condensed Matter and Materials Colloquium, *The Rheology of Polydisperse Charged Colloids from Light Scattering and Small Angle Neutron Scattering*, Los Alamos National Laboratory, 1990.
2. Univ. Konstanz, Physics, *Flow of Granular Materials*, and *New Results for the Viscosity of Brownian Suspensions*, Konstanz, Germany, 1990.
3. ETH Institute for Polymeres, *Rheology of Complex Fluids*, Eidgenoessische Technische Hochschule, Zurich Switzerland, 1992.
4. MPI for Polymer Research, *Dynamics and Rheology of Brownian Suspensions*, Max-Planck-Institute Mainz, Germany, 1992.
5. Los Alamos Condensed Matter and Materials Colloquium, *Massively Parallel Brownian Dynamics*, Los Alamos National Laboratory, 1993.
6. Uni. Konstanz, Physics, *Shear Induced Structures by Massively Parallel Computing*, Konstanz, Germany, 1993.
7. Dept. of Physics, Univ. of Delaware, *Generalized Hydrodynamics of Colloidal Suspensions*, Delaware 1993.
8. NATO Parallel Computing Workshop CECAM, *Simulations of Fracture Mechanics and Brownian Suspension Rheology*, Orsay, France, July 1993.
9. Uni. Konstanz, Physics, *New Developments in Suspensions Mechanics*, Konstanz, Germany, 1994.
10. Univ. Naples, Chemical Engineering Seminar, *LCP Rheology and LCP Blend Rheology*, University of Naples, Italy, 1994.
11. CRS4 Research Colloquium, *Parallel Computational Methods*, CRS4, Sardinia, Italy, 1994.
12. UC Berkeley, Chemical Engineering, *Advances in Fundamental Suspension Rheology*, Berkeley, 1994.
13. Univ. Illinois, Chemical Engineering, *Advances in Fundamental Suspension Rheology*, Illinois, 1994.
14. ASME Chicago National Meeting, *Rheology and Shear-Ordering in Suspensions by Massively Parallel Nonequilibrium Molecular Dynamics*, Chicago 1994.
15. Brooklyn Polytech, Chemical Engineering, *Advances in Fundamental Colloid Rheology*, Brooklyn NY, March 1995.
16. NIST, Reactor Division, *Liquid Crystalline Polymers* NIST, Gaithersburg, MD Nov., 1995.
17. City College, Chemical Engineering, *The Rheology of Concentrated Dispersions* NY, NY October, 1995.
18. Cornell Univ. Chemical Engineering, *Rheology of Concentrated Dispersions* Ithaca NY, Sept., 1995.
19. Univ. Freiburg, Dept. of Macromol. Chemistry, *Liquid Crystalline Polymers* Univ. Freiburg, Germany, Dec., 1996.
20. Georgia Tech., Chemical Engineering, *Rheology of Concentrated Colloidal Dispersions* Atlanta, Feb., 1996.
21. CRS4 Research Colloquium, *Simulation of Diffusion In Polymers*, CRS4, Italy, June, 1996.
22. ETH Institute for Polymers, *Role of Attractive Interactions in Colloid Rheology*, ETH Zurich, Switzerland, June, 1996.
23. Chemical Engineering of Santa Barbara, *Shear Thickening*, Jan. 1997.
24. Chemical Engineering at UCLA *Shear Thickening*, Jan. 1997.
25. ETH Zurich, Institute for Polymers, *Polymer Blends*, Feb. 1997.
26. Chemical Engineering at Univ. of Pennsylvania, *Shear Thickening* March 1997.
27. *Frontiers of Science*, National Academy of Science and Max-Planck Society, Munich, Germany, June, 1998 (invited participant)
28. Van't Hoff Laboratory, Utrecht Netherlands, *Attractive Interactions in Colloidal Systems*, Sept. 1997.
29. Gesellschaft Österreichischer Chemiker, Graz Austria, *Colloid Rheology* Oct. 1997.
30. FORUM-INFM Workshop on Polyelectrolytes, Pisa Italy, *Adsorption of Polyelectrolytes* Oct., 1997
31. University of Karlsruhe, Macromolecular Chemistry, Karlsruhe, Germany, *Colloid Rheology* Nov., 1997.

32. Universität Düsseldorf, Physik, Germany, *Colloid Rheology*, January, 1998.
33. Gordon Conference on Colloidal, Macromolecular, and Polyelectrolyte Solutions, Ventura CA. *Suspensions Rheology* Feb., 1998.
34. 7th Annual NSF Workshop on Particulate/Multiphase Flow, Santa Barbara, Feb. 1998 *Rheo-optical Methods for Colloids*.
35. American Crystallographic Association National Meeting, Colloidal Gels, July, 1998.
36. University of Mainz, Physical Chemistry, *Colloid Rheology*, Mainz, SFB seminar series, July, 1998.
37. Chemical Engineering at SUNY Buffalo, *Liquid Crystalline Polymers and LCP Containing Blends*, Oct., 1998.
38. Materials Research Society Spring National Meeting, *Liquid Crystalline Polymers and LCP Containing Blends, Structure and Rheology* San Francisco, April, 1999.
39. Chemical Engineering at Brooklyn Polytech., *Hydrodynamic and Colloidal Interactions in Concentrated Dispersions*, Brooklyn, NY Sept., 1999.
40. Chemical Engineering at Princeton, *Developing Thermodynamically Consistent Transport Equations: Examples for Complex Fluids & Multiphase Flow*, Princeton, Nov. 1999.
41. ACS MARM, *Rheological and Optical Characterization of Concentrated Colloidal Dispersions*, Newark, DE, May, 2000.
42. ACS MARM, *Rheology and Microstructure of Hyperbranched & Dendritic Polymers and Blends with Linear Polymers*, Newark, DE May, 2000.
43. Chemical Engineering at the University of Illinois, *Polyampholyte & Polymer stabilization of colloidal dispersions and the rheological consequences*, Champaign, IL, Sept. 2000.
44. Chemical Engineering, City College, NY, *Polyampholyte & Polymer stabilization of colloidal dispersions and the rheological consequences*, New York, NY, Oct. 2000
45. Condensed Matter Physics Seminar, University of Pennsylvania, *Engineering Colloidal Surfaces to Control High Shear Rheology*, January, 2001.
46. Macromolecular Science & Engineering Colloquium, Case Western Reserve University, *Rheology of Concentrated Colloidal Dispersions and Shear Thickening*, Cleveland, March, 2001.
47. Rheology Research Center, University of Wisconsin & Mechanical Engineering, "Charles Lindbergh Lectures", *Rheology of Concentrated Colloidal Dispersions*, Madison, WI, March, 2001.
48. Chemical Engineering, Carnegie Mellon University, *Rheology of Concentrated Colloidal Dispersions*, Pittsburgh, PA, April, 2001
49. Hellenic Society of Rheology 3rd International Conference, *Mechanism of Reversible Shear Thickening in Colloidal Dispersions*, Patras, Greece, June 2001.
50. Polymer Colloids Gordon Research Conference, *Engineering Colloidal Surfaces to Control High Shear Rheology*, Tilton School, New Hampshire, July, 2001.
51. PPG Lecture, Harvard University, Engineering and Applied Science, *Engineering Colloidal Surfaces to Control High Shear Rheology*, Cambridge, MA, Sept. 2001.
52. University of Pittsburgh, Chemical Engineering, *Engineering Colloidal Surfaces to Control High Shear Rheology*, Pittsburgh, PA, October, 2001.
53. Chemical Engineering, University of Virginia, *Rheology of Concentrated Colloidal Dispersions*, Charlotte, VA, April, 2002
54. Polymer Science and Engineering, Univ. Mass. *Structure-Property Relations of Dendrimers, Blends, and Dendrimer Hybrid Copolymers*, Amherst, , May 2002
55. ACS National Meeting, Division of Polymeric Materials Science and Engineering, *Electrosteric Stabilization of Colloidal Dispersions*, Boston, Aug. 2002.
56. Chemical Engineering, Worcester Polytechnical Institute, *Engineering Colloidal Surfaces to Control High Shear Rheology*, Worcester, MA, Nov. 2002.
57. Chemical Engineering, University of Minnesota, *Engineering Colloidal Surfaces to Control High Shear Rheology*, Dec. 2003

58. NIST, Gaithersburg, MD. Dec. 2003. *Engineering Colloidal Surfaces to Control High Shear Rheology*
59. Nanoparticles 2004, Orlando FL, ““Liquid Armor”: Nanoparticle Composites for Flexible Ballistic Materials & the Rheology of Anisometric Particle Dispersions”
60. Leeds University, England, Sept. 2004, *Frontiers in Particle Science Series: “Concentrated Dispersion Rheology”*.
61. Dept. of Physics, La Sapienza, Uni. Rome, Italy, Nov. 2004 “Shear Thickening in Colloidal Dispersions”
62. Jülich Soft Condensed Matter Symposium, Kerkrade, Netherlands, Nov. 2004, “Shear Thickening in Colloidal Dispersions”
63. EPFL, Lausanne, Switzerland, Jan. 2005, “The Rheology of Anisometric Particle Dispersions & ‘Liquid Armor’.”
64. American Chemical Society Spring National Meeting, San Diego, California on March 13-17, 2005. “Rheo-SANS”
65. “Modeling the Transfer of Polymers through Chara corallina Cell Walls”, Symposium in Honor of John Boyer, UD, June, 2005.
66. American Chemical Society National Meeting, Washington DC, Aug. 2005 “Rheo-SANS”
67. Univ. Florida, Chemical Engineering, “Shear Thickening in Colloidal Suspensions” Dec. 2005.
68. Temple University, Physics, “Dynamics of Concentrated Colloids: Approach to the Glass Transition and Shear Thickening”, April, 2006.
69. Princeton University PRISM, “ Colloid Rheology, Shear Thickening, and Novel Energy Adsorbing Materials for Ballistic and Stab Protection”, April, 2006.
70. North Carolina State University, Chemical Engineering, “The Rheology of Colloidal and Nanoparticle Dispersions: Nanoparticle Composites for Flexible Ballistic Materials”, April 2006.
71. Institute for Defense and Government Advancement (IDGA), Military Armor Protection, “STF-Armor”, Washington DC, May 2006.
72. Delaware Economic Development Office Chemical Industry Subcommittee, “STF-Armor”, Newark, DE May, 2006.
73. GaTech, PTE, “The Rheology of Colloidal & Nanoparticle Dispersions: “STF Armor”- Nanoparticle Composites for Flexible Ballistic Materials”, Sept. 2006, Atlanta, GA.
74. UT Austin, Chem. Eng. “The Rheology Of Colloidal & Nanoparticle Dispersions: ‘STF Armor’ - Nanoparticle Composites For Flexible Ballistic Materials”, Nov. 2006, Austin TX.
75. UPenn, Physics and Astronomy, Condensed Matter Colloquium, “Dynamics of Concentrated Colloids: Approach to the Glass Transition and Shear Thickening. April, 2007, Philadelphia, PA.
76. University of Erlangen, Germany “Dynamics and Rheology of Concentrated Colloidal Dispersions: Part I: Approach to the Glass Transition and Effects of Weak Attractive Interactions; Part II: Shear Thickening & Applications in Ballistic and Stab Protection”, Dept. of Chemical Engineering, April, 2007.
77. Tulane Univ. “The Rheology of Colloidal and Nanoparticle Dispersions: “STF ARMOR”- Nanoparticle Composites for Flexible Ballistic Materials”, Dept. Chem. Eng., Nov. 2007.
78. UC Riverside, “The Rheology of Colloidal and Nanoparticle Dispersions: “STF ARMOR”- Nanoparticle Composites for Flexible Ballistic Materials”, Dept. Chem. Eng., Feb. 2008.
79. Purdue University, “The Rheology of Colloidal and Nanoparticle Dispersions: “STF ARMOR”- Nanoparticle Composites for Flexible Ballistic Materials”, Dept. Chem. Eng., Feb. 2008.
80. NCR NIST, “Rheo-SANS”, NRC Assessment Council Meeting, March, 2008, Gaithersburg, MD.
81. American Conference on Neutron Scattering, 2008, “A Tale of Two Surfactants: Structure and Rheology of Shear-Banding Wormlike Micellar Solutions” May, 2008.
82. ISPAC “STF-Armor, Nanoparticle Composite Textiles and Performance Plastics for Flexible Ballistic & Puncture Protective Materials,” Newark, DE, June, 2008.

83. Mid Atlantic Soft Matter Workshop (MARM), "Microstructure of Shear Thickening Colloidal Dispersions," U. Penn, June 2008.
84. University of Konstanz, Physics Dept. "Microstructure of Shear Thickening Colloidal Dispersions," Konstanz, Germany, July 2008.
85. Institute for Mathematics and Its Applications, "Flowing Complex Fluids: Fluid Mechanics-Interaction of Microstructure and Flow", Minneapolis, Minn. Oct. 2009.
86. RPI, Chemical Engineering, "Microstructure and rheology relationships for concentrated colloidal dispersions: Shear thickening fluids and their applications." Troy, NY 2009.
87. Johns Hopkins, Depart. Physics & Astronomy, "Microstructure and rheology relationships for concentrated colloidal dispersions: Shear thickening fluids and their applications." Baltimore, MD, Sept. 2010.
88. Wayne St. University, Chemical Engineering, "Microstructure and rheology relationships for concentrated colloidal dispersions: Shear thickening fluids and their applications." Detroit, MI, Sept. 2010.
89. University of Washington, Chemical and Biomolecular Engineering, "Microstructure and rheology relationships for concentrated colloidal dispersions: Shear thickening fluids and their applications." Seattle, WA, Nov. 2011.
90. University of Michigan, "Microstructure and rheology relationships for concentrated colloidal dispersions: Shear thickening fluids and their applications." Chemical Engineering, Ann Arbor, Dec., 2011.
91. Univ. Chicago. Physics, "Microstructure and rheology relationships for concentrated colloidal dispersions: Shear thickening fluids and their applications.", Chicago, May, 2012.
92. UIUC, Chemical and Biomolecular Engineering, "Microstructure and rheology relationships for concentrated colloidal dispersions: Shear thickening fluids and their applications." Urbana-Champagne, May, 2012.
93. Swedish Neutron Scattering Society, "*Understanding the nonlinear dynamics of polymer-like micelles by combined time-resolved small angle neutron scattering (SANS) and large amplitude oscillatory shear (LAOS) rheology*" Stockholm, Sweden, August, 2012.
94. Lund University & European Spallation Source, "New Methods to Understand Steady and Transient Flows in Complex Fluids." Lund, Sweden, August, 2012.
95. Ostwald Kolloquium Humbolt University, "tOr-SANS time resolved oscillatory rheology and SANS on concentrated colloidal dispersions." Potsdam, Germany, Sept. 2012.
96. Leipzig University, Institute for Theoretical Physics, "New Methods to Understand Steady and Transient Flows in Complex Fluids.", Lund, Sweden, August, 2012.
97. University of Connecticut, "Microstructure and rheology relationships for concentrated colloidal dispersions: Shear thickening fluids and their applications." Chemical Engineering, Oct. 2012.
98. IIT Madras, 2 lectures Chemical Engineering & Physics, "Development of microstructure/rheology relationships for complex fluids: Understanding shear-banding in polymer-like micelles." & "Shear thickening fluids and their applications." Chennai, India, Nov. 2012.
99. IIT Gandhinagar, "Shear thickening fluids and their applications." Ahmedabad, India, Nov. 2012.
100. Bose Institute, "Shear thickening fluids and their applications." Kolkata India, Nov. 2012.
101. ETH-Zurich, Food Science, "Rheo-SANS: Development of microstructure/rheology relationships for complex fluids: Understanding shear-banding in polymer-like micelles." Zurich, Switzerland, Dec. 2012.
102. Karlsruhe Institute of Technology, "Rheo-SANS: Development of microstructure/rheology relationships for complex fluids: Understanding shear-banding in polymer-like micelles." Karlsruhe, Germany, Dec. 2012.
103. Cornell University, "Development of microstructure/rheology relationships for complex fluids: Understanding shear-

- banding in polymer-like micelles.” Ithaca, NY March 2013.
104. Levich Institute and City University New York, “Development of microstructure/rheology relationships for complex fluids: Understanding shear-banding in polymer-like micelles.” NY, NY March 2013.
105. University of Indiana, Physics, “How to Gels Form and Flow?” Bloomington IN, Dec. 2013.
106. Michigan State University: Science at the Edge, “STF Fluids and their Applications, January, 2014.
107. University of Toronto: Lectures at the Leading Edge, “STF Fluids and their Applications,” Toronto, CA, March 2014.
108. Oak Ridge National Laboratory, 4th Nanomaterials and Neutrons Research Forum, “How do colloidal gels form and flow?”, ORNL, TN, April 2014.
109. Lehigh University, Dept. of Chemical Engineering, “How do Gels Form and Flow?” Lehigh, PA, April 2014.
110. NCNR NIST Workshop, Plenary Lecture, “Probing the Dynamics of Soft Matter with Neutrons.” Gaithersburg, MD. August 2014.
111. Case Western Reserve University, Dept. of Macromolecular Science and Engineering, “How do Gels Form and Flow?” Cleveland, OH, Sept. 2014.
112. APS March Meeting, “Field responsive shear thickening fluids for personal protective equipment and MMOD shielding for spacecraft and astronauts”, San Antonio, TX, March 2015.
113. Georgetown University Physics Dept. “Shear thickening fluids and their applications as field-responsive protective materials.”, Georgetown, March, 2015.
114. Syracuse University, Department of Biomedical and Chemical Engineering, “How do Gels Form and Flow?”, Syracuse, NY, April 2015.
115. Int. Assoc. of Colloid and Interface Sci. “Shear thickening fluids and their application in personal protective equipment and space exploration.”, Mainz, Germany, May 2015.
116. Carnegie Mellon University Graduate Student Association, “The Micromechanics of Shear Thickening Fluids and Their Applications as Field-responsive Protective Materials and Shielding for Spacecraft and Astronauts.” Pittsburgh, PA October 22-23, 2015.
117. Materials Research Society, “SANS and Rheo-SANS study of particle dispersion and block copolymer and surfactant self-assembly in ionic liquids.” Boston, MA, Nov. Nov. 29-Dec. 4, 2015.
118. University of Oklahoma, Dept. of Chemical, Biological and Materials Engineering, “The micromechanics of shear thickening fluids and their applications as field-responsive protective materials and shielding for spacecraft and astronauts.”, Norman, OK, Feb. 24-25, 2016.
119. Widener University Science Seminar, “The micromechanics of shear thickening fluids and their applications as field-responsive protective materials and shielding for spacecraft and astronauts”, Chester PA, April 11, 2016.
120. NCNR/LENS Workshop on Neutron Probes of Hierarchical Materials: “Challenges in complex fluids and soft matter to be solved by neutron scattering”, Sept. 2016, NCNR NIST, Gaithersburg, MD.
121. SUNY Buffalo, Chemical Engineering, “The micromechanics of shear thickening fluids and their application as protective materials for medical professionals, first responders, football players, astronauts and spacecraft.” Oct. 5, 2016, Buffalo NY.
122. U. Minnesota, Chemical Engineering, “The micromechanics of shear thickening fluids and their application as protective materials for medical professionals, first responders, football players, astronauts and spacecraft.” Oct. 18, 2016, Minneapolis, MN.
123. U. Houston, Chemical Engineering, “How do colloidal gels form and flow?”, Oct. 28th Houston, TX
124. University of Delaware, Inaugural Ceremony for President Assanis, “Solving Engineering’s Grand Challenges with Neutrons”, December, 2016.

Industrial

1. Exxon Res. And Dev., *Dynamics and Rheology of Brownian Suspensions*, Annandale NJ, 1991.
2. Eastman Kodak, *Suspension Rheology*, Kodak Park., Rochester, 1993.
3. Unilever, *Rheology and Dynamics of Surfactant Systems*, Unilever, Edgewood, NJ, 1993.
4. Alcoa, *Flow of Suspensions*, ALCOA Tech. Center, Pittsburgh, 1994.
5. BASF AG, *Suspension Rheology*, Ludwigshafen, Germany, 1994
6. DuPont CR & D Research Colloquium, *The Interesting Rheology and Microstructure of Liquid Crystalline Polymers*, Wilmington, Feb., 1995.
7. DuPont Marshall Lab, *Advances in Fundamental Colloid Rheology*, Philadelphia, March, 1995.
8. DuPont Coatings Symposium, *Shear Thickening Rheology of Dispersions* Newark, DE, Oct. 1995.
9. Rohm and Haas, *Shear Thickening*, March 1997.
10. BASF AG, *Shear Stability*, Ludwigshafen Germany, June, 1997.
11. SPARK97, Unilever Research Internal Conference, *Rheology of Complex Fluids* Englewood NJ, Nov., 1997.
12. Rohm & Haas, *Colloidal Microstructure, Rheology and Characterization*, Springhouse PA, May, 1999.
13. Merck Research Labs, *Rheology of Concentrated Colloidal Dispersions*, West Point, PA, Oct., 1999.
14. Eastman Kodak, *Shear Stability*, Kodak Park, Rochester, June, 1998.
15. Cabot Corp., *SANS Methods to Study Particles*, Mass., planned for Sept., 1998.
16. Rohm and Haas, *Colloidal Microstructure, Rheology, and Characterization*, Spring House PA, May, 1999.
17. J.M. Huber, *Rheology of Concentrated Colloidal Dispersions*, Havre de Grace, MD, Oct. 2000
18. Rhodia, *Engineering Colloidal Surfaces to Control High Shear Rheology*, Cranbury, NJ, Jan. 2001.
19. Hercules, Inc., *Engineering Colloidal Surfaces to Control High Shear Rheology*, Wilmington, Feb. 2001.
20. Elan Pharmaceutical Technologies, *Engineering Colloidal Surfaces to Control High Shear Rheology*, April, 2001.
21. DuPont, Rheology Seminar, *Engineering Colloidal Surfaces to Control High Shear Rheology*, Wilmington, DE, May, 2001
22. Elan Pharmaceuticals, *Engineering Colloidal Surfaces to Control High Shear Rheology*, King of Prussia, PA, May, 2001
23. Bayer AG, Physics Group, *Engineering Colloidal Surfaces to Control High Shear Rheology*, Leverkusen, Germany, June, 2001
24. BASF AG, Polymer Physics, *Shear Thickening of Colloidal Dispersions*, Ludwigshafen, Germany, June, 2001
25. 11th Nisshin Engineering Particle Technology International Seminar (NEPTIS-11), *Shear Thickening of Colloidal Dispersions*, Dec. 8-10, Kyoto, Japan, 2002.
26. ExxonMobil, *Nonequilibrium Thermodynamics of Complex Fluids: Engineering Colloidal Interactions to Control Reversible Shear Thickening in Concentrated Dispersion*, Annandale, NJ, April, 2003.
27. DuPont CR&D UD Seminar Series, *Engineering Colloidal Interactions to Control Reversible Shear Thickening in Concentrated Dispersions*, Wilmington, DE, Jan, 2004.
28. W.L. Gore, "Liquid Armor": Nanoparticle Composites for Flexible Ballistic Materials and the Rheology of nanoparticle & Anisometric Particle Dispersions, Elk Mills, MD, April, 2004.
29. Unilever, Wormlike Micelle Solutions: mixed cationic-anionic systems, rheology and microstructure relationships , Edgewater, NJ, June 2004.
30. Hercules Inc. "Liquid Armor": Nanoparticle Composites for Flexible Ballistic Materials and the Rheology of nanoparticle & Anisometric Particle Dispersions, Wilmington, DE, July, 2004.
31. Institute for Defense and Government Advancement, Lightweight Materials for Defense, "Shear Thickening Fluids: Applications in Flexible Ballistic and

- Puncture-Resistant Materials.” Washington D.C., March 2005. (with Eric Wetzel).
32. Eastman Kodak, “Polymer Stabilized Colloidal Dispersions: Rheology, Phase Behavior and Microstructure”, Rochester, Nov. 2005.
 33. Rohm & Haas Electronic Materials, “Nanoscale Directed Self Assembly in Electrical and Optical Fields”, Newark, DE, June 2006.
 34. Invista, “Shear Thickening Fluids: Applications in Flexible Ballistic and Puncture-Resistant Materials.”, Newark, DE Jan. 2007.
 35. RatnerPrestia, “Shear Thickening Fluids: Applications in Flexible Ballistic and Puncture-Resistant Materials.”, Valley Forge, PA, June 2007.
 36. Semiconductor Research Corporation, Directed Self-Assembly in Electrical and Optical Fields, Amherst, MA, Nov. 2008.
 37. TA Instruments Users Meeting, Invited Lecture: “Development of microstructure/rheology relationships for complex fluids: Rheo-SALS, Rheo-Microscopy & tOR-SANS.” New Orleans, May, 2012.
 38. DuPont, Experimental Station, “New methods to combine Small Angle Neutron Scattering with rheology to develop structure-property relationships for polymer solutions and concentrated colloidal dispersions.”, Wilmington, DE, May 2012.
 39. General Electric Global Research, “Microstructure and rheology relationships for concentrated colloidal dispersions: Shear thickening fluids and their applications.” Niskayuna, NY, May 2012.
 40. ExxonMobil Research and Engineering, “Rheo-SANS Applied to Soft Matter” Clinton NJ June 2013.
 41. Evonik North America, “Dynamic Rheology and Microstructure of Wormlike Micelles”, Atlantic City, Sept. 2013.
 42. ExxonMobil Chemical, “Dynamic Rheology and Microstructure of Wormlike Micelles” Baytown Texas, Feb. 2014.
 43. Syngenta, “How do Gels Form and Flow?” Jealott’s Hill, England, June, 2014.
 44. Solvay, “How do Gels Form and Flow?”, Bristol PA, January 2015.
 45. TA Instruments User Meeting, “How do Gels Form and Flow?” February, 2015.

Short Courses

1. *Phase Equilibria* (with M. Paulaitis), Jan 28-30th 1996 Midland, MI. Sponsored by the local AIChE section.
2. *Suspensions and Complex Fluids Lectures* (4 lectures), BASF AG, Ludwigshafen, Germany, June 1995.
3. *Rheo-Optics* invited lecture at the *Complex Fluid Materials* Materials Sci. Summer Institute, Lakewood NJ, July 1998.
4. *Colloidal Dispersions*, CMET Short Course, University of Delaware, Spring 1999.
5. *Colloid Rheology*, 25th Annual Short Course on Rheological Measurements, University of Minnesota, Minneapolis, June 4-9, 2000.
6. *Particle Design and Processing* (with J. Litster & F. Doyle), University of Delaware, January, 2001.
7. *Particle Design and Processing* (with J. Litster & F. Doyle), Merck, West Point, PA, January, 2001
8. *Rheology of Colloidal Dispersions* Short Course (with W.B. Russel), Society of Rheology National Meeting, Hilton Head Island, February, 2001.
9. *Particle Design and Processing* (with J. Litster & E. Kaler), University of Delaware, Feb., 2002.
10. *Particle Design and Processing* (with J. Litster & G. Tardos), Merck, West Point, PA, Feb., 2002
11. *Colloid Rheology* (with J. Mewis), Paar Physica Rheology Class, UofD, Feb. 2004.
12. *Directed Self Assembly* (with E.W. Kaler, E.M. Furst, J. F. Brady, and O. Velev), Univ. of Delaware, June 2007.
13. *Rheo-SANS: Structure-Property Relations under Flow and Dynamics*, SANS tutorial, ACNS, Santa Fe, May 2008.
14. *Colloidal Suspension Rheology* (with J. Mewis), XVth Int. Congress of Rheology, Monterey, CA, Aug. 2008.
15. *Colloidal Suspension Rheology* (with J. Mewis), Society of Rheology, Santa Fe NM, Oct. 2010

16. *Colloidal Suspension Rheology* (with J. Mewis), University of Delaware Outreach and TA Instruments, New Castle DE, May 2012.
17. *Colloidal Suspension Rheology* Technical University of Berlin, Berlin, Sept. 2012.
18. *Colloidal Suspension Rheology* (with J. Mewis), XVIth Int. Congress of Rheology, Lisbon, Portugal, Aug. 2012.
19. *Colloidal Suspension Rheology* (with E.M. Furst), DuPont Experimental Station, June, 2013.
20. *Colloidal Suspension Rheology* (with Jan Mewis), Society of Rheology National Meeting, Philadelphia, 2014.
21. *Colloidal Suspension Rheology* (with Jan Mewis), ETHZ, Switzerland, June 2015.

Webinars:

08/27/2014 TA Instruments: “An Introduction to Colloidal Suspension Rheology”

<https://www.youtube.com/watch?v=3vcMkC-voLc&list=PLyFxSNY0W6tqAVrYdoqXsVPwgeILu8y4d&index=25>

07/19/2015 White House Office of Science and Technology Policy “We the Geeks: The Stuff Superheroes Are Made Of.” Liquid Armor

<https://obamawhitehouse.archives.gov/blog/2013/07/17/we-geeks-stuff-superheroes-are-made>

09/02/2016 American Chemical Society Webinar: Materials Science Series, [Future Protective Materials for First Responders, Football Players, and Astronauts: Shear Thickening Fluids – American Chemical Society](#) American Chemical Society:

2/21/2017 American Chemical Society, “Chemistry in a box” series: Chemistry of Sports <https://www.acs.org/content/acs/en/acs-webinars/program-in-a-box/pib-on-demand/sports.html>

POSTDOCS, PHD, MCHE AND SENIOR THESES:Postdoctoral Students Mentored (23):

1. Michael Kotelyanskii (95-96) (Penn State)
2. Adriana de Silva (98, Dow)
3. Igor Bodnar (98-99, DSM)
4. Leo Hanus (99-00, AZ Electronics)
5. Markus Banerjee (98-99, Rohde & Schwarz, Germany)
6. Young Sil Lee (2004, Samsung, Korea)
7. Stacey Elliot (2002, DuPont, Philadelphia)
8. Raphael Pesche (2002, Freiburg, Germany)
9. Gerhard Fritz (2002, Graz, Austria)
10. Matthew Liberatore (2004-5, Col. School. Mines)
11. Emily Pollauf (2005, U. Colorado)
12. Carline Nam (2006, Infineon)
13. Jeff Rimer (2007, U. Houston)
14. Rich Dombrowski (2008-9)
15. Florian Nettesheim (2004-7, Alexander von Humbolt Fellow, DuPont)
16. Manish Kelkar (2008-2009, DuPont)
17. Aaron Eberle (2008-2010, ExxonMobil)
18. Carlos Lopez-Barron (2010-12, ExxonMobil)
19. Prachi Thareja (2008-2011, IIT Gandhinagar, India)
20. Basa Madivala (2008-2010, IIT Madras, India)
21. Rose Ndong (2011-2012, Rhodia)
22. Simon Rogers (2012-14, Assistant Professor, UIUC)
23. Kevin Whitcomb (2014-)
24. Jeffrey Richards (2014, currently NRC Postdoc NCNR, NIST)
25. John Riley (2015, currently NRC Postdoc NCNR, NIST)
26. Maria Katzarova (2016-)

Research Scientists and Engineers (2)

1. Richard Dombrowski (2008-2013)
2. Kathy Zetune (2008-11, 12-13)

PhD Students Mentored (42):

1. Jonathan W. Bender, Delaware, 1995
RheoOptical Investigations of the Microstructure of Model Colloidal Suspensions
2. Lynn M. Walker (Carnegie Mellon Univ.), Delaware, 1995.
Rheology and Rheo-Optics of Liquid Crystal Polymers Under Flow
3. Sanjeev R. Rastogi (Union Carbide), Delaware, 1995
Nonequilibrium Brownian Dynamics of Colloidal Suspensions
4. Johan Bergenholtz¹ (Univ. Goteborg, Sweden), Delaware 1996
Statics and Dynamics of Colloidal Suspensions with Attractive Interactions
5. Maria de Jesus van Eijndhoven Rivera (GE, Netherlands), Delaware, 1997

¹ Colburn Award 1996, Univ. of Delaware

- Flow Induced Morphological Transitions in Polymer Blends Containing Liquid Crystalline Polymers*
6. William A. Kernick III (General Electric Plastics), Delaware, 1998
Rheology and Morphology of Polymer Blends Containing Liquid Crystalline Polymers
 7. Thomas R Cuthbert, (Union Carbide/DOW), Delaware 1998
Transport of Small Penetrants in Polymer Glasses: Investigations via Simulation and Experiment
 8. Konstantin Abraham Vaynberg (Hercules), Delaware, 1999
Rheology and Shear Aggregation of Gelatin Stabilized Colloids
 9. Eleni Dokou (Merck), Delaware, 2001 (with Mark Barteau and Abraham Lenhoff)
Scanning probe microscopy studies of chemical and physical properties of particulate systems
 10. Brent J. Maranzano (Pfizer), Delaware, 2001
Rheology and Microstructure of Concentrated Near Hard Sphere Colloidal Dispersions at the Shear Thickening Transition
 11. Brian M. Tande (Univ. North Dakota), Delaware, 2002
The Rheology, Microstructure, and Phase Behavior of Dendritic and Hyperbranched Polymers
 12. Sudhir S. Shenoy (Schlumberger), Delaware, 2003
Electric Field Effects on the Rheology of Shear Thickening Colloidal Dispersions
 13. Beth A. Schubert (P&G), Delaware, 2003 (with E.W. Kaler)
The Rheology and Microstructure of Charged, Wormlike Micelles
 14. Jan. H.D. Boshoff (Sasol), Delaware, 2004 (Joint with R. Lobo)
Configurational Diffusion in Glassy, Amorphous Polymers: Effects of Polymer Structure and Dynamics on Permeation via Molecular Simulation
 15. Lakshmi Narasimhan Krishnamurthy (DuPont), Delaware, 2005
Microstructure and Rheology of Polymer-Colloid Mixtures
 16. Ronald G. Egres, Jr.² (DuPont), Delaware, 2005
The Effects of Particle Anisotropy on the Rheology and Microstructure of Concentrated Colloidal Suspensions through the Shear Thickening Transition
 17. Armin Opitz (Genzyme), Delaware, 2008.
Structural and Functional Investigations of a Molecular Imaging Nanoparticle for Magnetic Resonance Imaging of Oncogene Expression in the Pancreas,
 18. Monica C. Branco (GSK) (Delaware 2009, Joint with Joel Schneider)
Understanding the Structure, Dynamics, and Mass Transport Properties of Self-Assembling Peptide Hydrogels for Injectable Drug Delivery Applications
 19. Matthew E. Helgeson³ (UCSB), Delaware 2009
Structure, Rheology, and Thermodynamics of Wormlike Micelle-Nanoparticle Mixtures
 20. Jason McMullan (ExxonMobil), Delaware, 2010
Directed Self-Assembly of Colloidal Crystals with Electric and Shear Fields
 21. Dennis P. Kalman (Solvay), Delaware, 2010
Microstructure and Rheology of Concentrated Suspensions of Near Hard-Spheres
 22. Amit Kumar (IIT Gurawati, India) Delaware, 2010 (with Raul Lobo)
Configurational diffusion of small gas molecules in nanostructured materials: a

² Roy L. McCullough Scholars Award, CCM 2005

³ Victor K. LaMer Dissertation Award, American Chemical Society Division of Colloid and Interface Science, 2011

- computational and experimental study*
23. Carrie B. Street (Valspar) Delaware 2012
Rheophysics of Thixotropic Pastes: The Rheology and Microstructure of Systems Containing Surfactants and a Crystallizing Fatty Acids
 24. Mark Pancyzk (Ingredion) Delaware, 2013 (with E. Furst)
Directed Assembly and Dynamics of Anisotropic Particles
 25. Jung Min Kim (Pepsico) Delaware 2013
Effect of the Range of Attraction on the Rheology, Microstructure and Thermodynamics of Thermoreversible Gels with Adhesive Hard Sphere Interactions
 26. Dongcui Li (Lubrizol) Delaware 2013
Toward the Rational Design of Polyelectrolyte Surfactant Complexes: Thermodynamics, Microstructure and Property
 27. A. Kate Gurnon⁴ (GE Global Research) Delaware 2014
Nonlinear Oscillatory Rheology and Structure of Wormlike Micellar Solutions and Colloidal Suspensions
 28. P. Doug Godfrin⁵ (MIT, postdoc) Delaware 2015
Thermodynamic and material properties of reversible cluster formation - Application to concentrated protein solutions
 29. Colin Cwalina (DOW, Collegeville, PA) Delaware 2015
Shear thickening fluids for enhanced protection from micrometeoroids and orbital debris
 30. Jingsi Gao (Monsanto) Delaware 2017
Rheology and microstructure of stable concentrated ionic liquid colloidal suspensions
 31. Dan Greene (2016, joint with A. Lenhoff)
The formation and structure of precipitated protein phases
 32. Melissa Gordon (Assistant Professor, Lafayette College, PA, NSF Fellow, joint with C. Kloxin) Delaware, 2017
The Development and Characterization of Stimuli-Responsive Systems for Performance Materials
 33. Lt. Col. Matthew Armstrong (joint with A. Beris, Assistant Professor, West Point Academy) Delaware 2015
Investigating and modeling the thixotropic behavior, microstructure, and rheology of complex material
 34. Stephan Ma (2016, NSF Fellow, joint with C. Kloxin)
 35. Michelle Calabrese (2017)
 36. Paul Mswame (2017, joint with A. Beris)
 37. Stijn Koshari (2019, joint with A. Lenhoff)
 38. Ru Chen (2018, NSF Fellow)
 39. Jannat Nayem(2019, NSF Fellow, joint with Yun Liu)
 40. Julie Hipp (2015)
 41. Ying-heng Summer Tein (2016)
 42. Seyeon Park (2016, joint with E. Furst)

⁴ Allan P. Colburn Dissertation Award, University of Delaware, 2015.

⁵ 2016 Prize for Outstanding Student Research, Neutron Scattering Society of America.

Doctoral Students at Foreign Institutions (1):

1. Marc Sommer, Erlangen, 2007 (co-supervised Uni. Erlangen, Prof. Wolfgang Peukert)
Mechanical Production of nanoparticles in Stirred Media Mills

MCHE (7):

1. Richard Pittman Delaware, (Primary Advisor: Nily Dan) Delaware 1998
Colloidal Stabilization by Polyelectrolyte Adsorption
2. Joseph Amante (Proctor & Gamble) Delaware 1998
Investigation of Shear Thickening Colloidal Dispersions
3. Kenneth D. Smith (UMass., PhD) Delaware 2003 (Joint with Eric Kaler)
Microstructure, Rheology, and Dynamics of Colloidal Particles in a Model, Self-Assembled Surfactant Solution
4. Vikram Kumar Daga (UMass PHD) Delaware 2006
Rheology and Electrospinning of Neat and Laponite-Filled Poly(ethylene oxide) Solutions
5. Kate Hollabaugh (Dow, Joint with Eric Kaler), Delaware 2008
Microstructure and Rheology of Mixed Ionic Surfactants.
6. Stijn Khoshari (KU Leuven Dual MCHC, Joint with A. Lenhoff), Delaware 2014
Characterization of Lysozyme Adsorption in Cellulosic Chromatographic Particles using Small-Angle Neutron Scattering.
7. Yun Soo Kim (LG, Korea) Delaware 2015 *Effect of particle anisotropy on suspension rheology and phase behavior with tunable attractive strength.*

Undergraduate Senior Theses & Honors Theses (29):

1. Aldo Romagnoli III (Fugi, Japan) Delaware, 1994
Stability and Flocculation of Colloidal Organic Dyes used in Film Emulsion
2. Patricia Wu, Delaware 1994
Modified Monte-Carlo Simulation of the Square-well Fluid
3. Kristina Abiles, Delaware 1995
Stability of Photographic Dye Dispersions
4. Tara M Kaszowicz, Delaware 1996 (Degree with Distinction)
Characterization of Hyperbranched Polyphenylenes
5. James Jariwala, Delaware 1998
Effect of Hyperbranched Polymers on the Viscosity of Industrial Polymers
6. Ashley E. Cooper⁶ (Exxon Mobil), Delaware 1999 (Degree with Distinction)
Microstructure and Properties of Hyperbranched Polymers for Rheology Modification
7. Robert W. Deitcher, Jr. (Merck), Delaware 2000 (Degree with Distinction)
Application of Group Contribution Predictive Theory to Dendrimer Thermodynamics
8. Jonathan Davis (Princeton, PhD), Delaware 2000 (Degree with Distinction)
Nonequilibrium Thermodynamics of Multiphase Flow
9. Lisa Dietrich (Merck), Delaware 2001 (Degree with Distinction)
10. Martin Convey, Delaware 2003 (with Steve Dentel, Civil Engineering)
The Effect of Shear on the Compression of Flocculated Suspensions: Application to Belt-Filter Press Dewatering
11. Cory C. Mulcahy, Delaware 2003 (Joint with John S. Boyer)

⁶ UD Undergraduate Thesis Award, UD

- Delivery of Polymers to the Cell Walls of Chara corallina*
12. John Kirkwood⁷, Delaware 2004 (Degree with Distinction)
Shear Thickening Fluid Containment in Polymer Composites
 13. Keith Kirkwood⁸ Delaware 2004 (Degree with Distinction)
Carbon Nanotube Dispersions
 14. Philip Matthews⁹, Delaware 2004
Advanced Shear Thickening Fluid Applications
 15. Jessica Penetar, Delaware 2005
The Integration of Silver Nanoparticles into Poly(ethylene oxide) Fibers
 16. Holly Schaeffer, Delaware, 2005 (coadvised Ismat Shah)
 17. Andrew Klein, Delaware 2006
Rheo-SALS Study of Wormlike Micellar Surfactant Solutions Including Silica Particles
 18. Matthew Decker¹⁰, Delaware 2006 (Degree with Distinction)
The Influence of Adsorbed Polymer on the Rheology and Shear Stability of Concentrated Colloidal Dispersions
 19. Joe Houghton¹¹, Delaware 2007 (Degree with Distinction)
Effect of Particle Hardness in Shear Thickening Fluids
 20. Kristie Grammatikos Delaware 2007
Anisotropic Particles and Polymer Electrospinning
 21. Brian Rosen, Delaware 2008 (Degree with Distinction)
Effect of Colloidal Shape on Fluid Flow and STF Material Performance
 22. Matthew Reichert, Delaware, 2008 (Degree with Distinction)
Using Rheo-SALS to Investigate Shear Banding and Isotropic to Nematic Phase Transitions
 23. Benjamin Schiffman, Delaware, 2008
Rheomicroscope for the Study of Complex Fluids under Shear
 24. Jeffrey Knopf, Delaware, 2009 (Honors Degree with Distinction).
Electrospinning
 25. Leo DeRita (2013)
Self-assembly of Surfactant Systems in Ionic Liquids: Structural and Rheological Analysis.
 26. Keyi Xu (2015)
Dynamic Rheological Properties of Field Responsive Nanomaterials for Application in Transtibial Prosthesis
 27. Charles McCutcheon (2016) Degree with Distinction
Synthesis and Rheological Study of Calcium Fluoride Colloidal Dispersions
 28. Koty McAllister (2017) Degree with Distinction (in progress)
 29. Roxana Mitrut (2017) (in progress)

⁷ CCM Undergraduate Research Award, 2003

⁸ CCM Undergraduate Research Award, 2003

⁹ CCM Undergraduate Research Award, 2004

¹⁰ CCM Undergraduate Research Award, 2005

¹¹ CCM Undergraduate Research Award, 2006

Diplomarbeit (4):

1. Ricarda Ziegler (BASF AG) FH Albstadt-Sigmaringen, Germany, 2001 (Erster Prüfer: Dr. Armin Wolff)
Structure and Rheology of Xanthan Gum Solutions: Effect on Ultrafiltration
2. Tessa N. Paschke, Ludwig-Maximilian-University of Munich, Germany, 2002 (with: S. Sandler, Prof. T. Bein)
Vapor-liquid equilibria of dendrimer-alcohol systems and their comparison to group contribution predictive theory.
3. Kerstin Weiss, TU Aachen, 2008. Praktikum:
Wormlike Micelles.
4. Peter Roozmond (Eindhoven) 2008 (co-advised with Pam Cook)
Numerical Study of Shear Banding WLMs