

## Christine M. Hrenya – Professor

Department of Chemical and Biological Engineering  
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### EDUCATION

Carnegie Mellon University, Pittsburgh, PA (Aug 91 – May 96)  
Ph.D. in Chemical Engineering  
Dissertation Title: *Dense, Turbulent Gas-Solid Flows in Vertical Risers*  
Advisor: Professor Jennifer Sinclair Curtis

The Ohio State University, Columbus, OH (Sep 87 – Jun 91)  
B.S. in Chemical Engineering, *summa cum laude*

City of London Polytechnic, London, England (Aug 90 – Dec 90)  
London Humanities Study Abroad Program in conjunction with Beaver College,  
Glenside, PA

Purdue University, West Lafayette, IN (Aug 86 – May 87)  
Major: Chemical Engineering

### PROFESSIONAL EXPERIENCE

Professor, University of Colorado at Boulder, Department of Chemical and Biological Engineering (May 2011 – present) and Affiliated Faculty, Department of Applied Mathematics (Mar 2003 – present)

Associate Professor, University of Colorado at Boulder, Department of Chemical and Biological Engineering (Aug 2005 – May 2011)

Assistant Professor, University of Colorado at Boulder, Department of Chemical and Biological Engineering (Aug 1998 – Aug 2005)

Honeywell Technology Center, Minneapolis, MN (Jun 1996 – Jul 1998)

The Dow Chemical Company, Midland, MI (Summer 1995)

E. I. du Pont de Nemours & Co., Circleville, OH (Summer 1991)

The Dow Chemical Company, Granville, OH (Summer 1990)

Eastman Kodak Co., Rochester, NY (Summer 1989)

E. I. du Pont de Nemours & Co., Circleville, OH (Summer 1988)

### HONORS AND AWARDS

University of Colorado College of Engineering Hutchinson Memorial Teaching Award (2010)

AICHE Particle Technology Forum Best Paper Award (2010)

University of Colorado Outstanding Graduate Teaching Faculty in Chemical Engineering (2010)

University of Colorado Emerging Leaders Program Fellow (2009 – 2010)

AICHE Best PhD in Particle Technology Award to advisee, Janine Galvin (2008)

University of Colorado Provost's Faculty Achievement Award (2008)

University of Colorado Dean's Faculty Fellowship (2008)

ACS PROGRESS/Dreyfus Lectureship Award (2006)

Chair, Gordon Conference on Granular and Granular-Fluid Flow (2006)

Visiting Faculty, University of Florida, Physics Department (2006)  
Visiting Faculty, Loughborough University (United Kingdom), Wolfson School of Mechanical and Manufacturing Engineering (2005 – 2006)  
AIChE Marx Isaacs Newsletter Award (2004)  
NSF POWRE Award (1999)  
University of Colorado Chemical Engineering Faculty Fellowship (2001)  
University of Colorado Junior Faculty Development Award (1999)  
AIChE Particle Technology Forum Award for Best Ph.D. in Particle Technology (1997)  
DuPont Ph.D. Fellowship (1991-1995)  
Carnegie Fellowship (1991-1993)

## REFEREED JOURNAL PUBLICATIONS AND BOOK CHAPTERS

(corresponding author underlined)

- 1) Chew, J. W., R. Hays, J. G. Findlay, T. M. Knowlton, S. B. R. Karri, R. A. Cocco and C. M. Hrenya, “Cluster characteristics of Geldart Group B particles in a pilot-scale CFB riser. I. Monodisperse,” under review.
- 2) Chew, J. W., R. Hays, J. G. Findlay, T. M. Knowlton, S. B. R. Karri, R. A. Cocco and C. M. Hrenya, “Cluster characteristics of Geldart Group B particles in a pilot-scale CFB riser. II. Polydisperse,” under review.
- 3) Chew, J.W., D. M. Parker, and C. M. Hrenya, “Elutriation and species segregation characteristics of polydisperse mixtures of Group B particles in a dilute CFB riser,” *AIChE Journal*, submitted.
- 4) Chew, J. W., R. Hays, J. G. Findlay, T. M. Knowlton, S. B. R. Karri, R. A. Cocco and C. M. Hrenya, “Species segregation of binary mixtures and a continuous size distribution of Group B particles in riser flow,” *Chemical Engineering Science*, submitted.
- 5) Chew, J. W., R. Hays, J. G. Findlay, T. M. Knowlton, S. B. R. Karri, R. A. Cocco and C. M. Hrenya, “Reverse Core-Annular Flow of Geldart Group B Particles in Risers,” *Powder Technology*, submitted (invited to appear in special issue).
- 6) Mitrano, P. P., S. R. Dahl, D. J. Cromer, M. S. Pacella, and C. M. Hrenya, “Instabilities in the homogeneous cooling of a granular gas: A quantitative assessment of kinetic-theory predictions,” *Physics of Fluids*, submitted.
- 7) Holloway, W., S. Benyahia, C. M. Hrenya, and S. Sundaresan, “Meso-scale structures of bidisperse mixtures of particles fluidized by a gas,” *Chemical Engineering Science*, submitted.
- 8) Murray, J. A., C. M. Hrenya, and V. Garzó, “Enskog Theory for Polydisperse Granular Mixtures. III. Comparison of dense and dilute transport coefficients and equations of state for a binary mixture,” *Powder Technology*, submitted.
- 9) Chew, J. W. and C. M. Hrenya, “Link between bubbling and segregation patterns in gas-fluidized beds with continuous size distributions,” *AIChE Journal*, in press.

- 10) Hrenya, C. M., “Active Learning in Fluid Mechanics: YouTube Tube Flow and Puzzling Fluids Questions,” *Chemical Engineering Education*, in press.
- 11) Passalacqua, A., J. E. Galvin, P. Vedula, C. M. Hrenya, and R. O. Fox, “A quadrature-based kinetic model for dilute non-isothermal granular flows,” *Communications in Computational Physics*, **10**, 216-252 (2011).
- 12) Hrenya, C. M., “Kinetic theory for granular materials: Polydispersity,” in *Computational Gas-Solids Flows and Reacting Systems: Theory, Methods and Practice*, S. Pannala, M. Syamlal, and T. O’Brien (eds.), IGI Global, Hershey, PA (2011).
- 13) Chew, J. W., J. Wolz, and C. M. Hrenya, “Axial segregation in bubbling gas-fluidized beds with Gaussian and lognormal Distributions of Geldart group B particles,” *AIChE Journal*, **56**, 3049-3061 (2010).
- 14) Donahue, C. M., C. M. Hrenya, and R. H. Davis, “Stokes’s cradle: Newton’s cradle with liquid coating,” *Physical Review Letters*, **105**, art. no. 034501, 4 pages (2010); this work was featured in *Nature* (**466**, 22 July 2010, p. 417) and the *New Scientist* (**2768**, 8 July 2010).
- 15) Tenneti S., R. Garg, C. M. Hrenya, R. O. Fox and S. Subramaniam, “Direct numerical simulation of gas-solid suspensions at moderate Reynolds number: Quantifying the coupling between hydrodynamic forces and particle velocity fluctuations,” *Powder Technology*, **203**, 57-69 (2010).
- 16) Hrenya, C. M., “Extraction of transport coefficients from molecular dynamics simulations: A perspective,” *Industrial & Engineering Chemistry Research*, **49**, 5304-5409 (2010); invited paper for special issue honoring Dimitri Gidaspow.
- 17) Donahue, C. M., C. M. Hrenya, R. H. Davis, K. J. Nakagawa, A. P. Zelinskaya, and G. G. Joseph, “Stokes’ cradle: normal three-body collisions between wetted particles,” *Journal of Fluid Mechanics*, **650**, 479-504 (2010).
- 18) Rice, R. B. and C. M. Hrenya, “Clustering in rapid granular flows of binary and continuous particle size distributions,” *Physical Review E*, **81**, art. no. 021302, 9 pages (2010).
- 19) Henthorn, K. H. and C. M. Hrenya, “Particle cohesion,” *Encyclopedia of Chemical Processing*, **1**, 1-8 (2009).
- 20) Rice, R. B. and C. M. Hrenya, “Characterization of clusters in rapid granular flows,” *Physical Review E*, **79**, art. no. 021304, 9 pages (2009).
- 21) Kantak, A. A., C. M. Hrenya, and R. H. Davis, “Initial rates of aggregation for dilute, granular flows of wet (cohesive) particles,” *Physics of Fluids*, **21**, art. no. 023301, 13 pages (2009).

- 22) Donahue, C. M., C. M. Hrenya, A. P. Zelinskaya, and K. J. Nakagawa, "Newton's cradle undone: Experiments and collision models for the normal collision of three solid spheres," *Physics of Fluids*, **20**, art. no. 113301, 11 pages (2008).
- 23) Leboireiro, J., G. G. Joseph, C. M. Hrenya, D. M. Snider, S. S. Banerjee, and J. E. Galvin, "The influence of binary drag laws on simulations of species segregation in gas-fluidized beds," *Powder Technology*, **184**, 275-290 (2008).
- 24) Leboireiro, J., G. G. Joseph, and C. M. Hrenya, "Revisiting the standard drag law for bubbling, gas-fluidized beds," *Powder Technology*, **183**, 385-400 (2008).
- 25) Hrenya, C. M., J. E. Galvin, and R. D. Wildman, "Evidence of higher-order effects in thermally-driven, rapid granular flows," *Journal of Fluid Mechanics*, **598**, 429-450 (2008).
- 26) Joseph, G. G., J. Leboireiro, C. M. Hrenya, and A. R. Stevens, "Experimental segregation profiles in bubbling gas-fluidized beds," *AIChE Journal*, **53**, 2804-2813 (2007).
- 27) Garzó, V., J. W. Dufty, and C. M. Hrenya, and, "Enskog theory for polydisperse granular mixtures. I. Navier-Stokes order transport", *Physical Review E*, **76**, art. no. 031303, 27 pages (2007).
- 28) Garzó, V., C. M. Hrenya, and J. W. Dufty, "Enskog theory for polydisperse granular mixtures. II. Sonine polynomial approximation", *Physical Review E*, **76**, art. no. 031304, 20 pages (2007).
- 29) Weber, M. W. and C. M. Hrenya, "Computational study of pressure-drop hysteresis in fluidized beds," *Powder Technology*, **177**, 170-184 (2007).
- 30) Galvin, J. E., C. M. Hrenya, and R. D. Wildman, "On the role of the Knudsen layer in rapid granular flows," *Journal of Fluid Mechanics*, **585**, 73-92 (2007).
- 31) Carney, C. S., C. J. Gump, C. M. Hrenya, and A. W. Weimer, "Rapid Nickel Oxalate Thermal Decomposition for Producing Fine Nickel Metal Powders. Part 2: Global Kinetics," *Materials Science and Engineering A*, **431**, 13-25 (2006).
- 32) Weber, M. W. and C. M. Hrenya, "Square-well Model for Cohesion in Fluidized Beds," *Chemical Engineering Science*, **61**, 4511-4527 (2006).
- 33) Hrenya, C. M. and H. Scott Fogler, "Patten Centennial Scientific Workshop: The Next Millennium in Chemical Engineering," *Chemical Engineering Education*, 99-103 (Spring 2006).
- 34) Walsh, J. K., A. W. Weimer, and C. M. Hrenya, "Thermophoretic deposition of aerosol particles in laminar tube flow with mixed convection," *Journal of Aerosol Science*, **37**, 715-734 (2006).

- 35) Walsh, J. K., A. W. Weimer, and C. M. Hrenya, “An experimental study of thermophoretic deposition of aerosol particles in laminar tube flow with mixed convection,” *Aerosol Science and Technology*, **40**, 178-188 (2006).
- 36) Dahl, S. R. and C. M. Hrenya, “Size Segregation in Gas-Solid Fluidized Beds with Continuous Particle Size Distributions,” *Chemical Engineering Science*, **60**, 6658-6673 (2005).
- 37) Stevens, A. and C. M. Hrenya, “Comparison of soft-sphere models to measurements of collision properties during normal impacts,” *Powder Technology*, **154**, 99-109 (2005).
- 38) Iddir, H., H. Arastoopour, and C. M. Hrenya, “Analysis of binary and ternary granular mixtures using the kinetic theory approach,” *Powder Technology*, **151**, 117-125 (2005).
- 39) Galvin, J. E., S. R. Dahl, and C. M. Hrenya, “On the role of non-equipartition in the dynamics of rapidly-flowing, granular mixtures,” *Journal of Fluid Mechanics*, **528**, 207-232 (2005).
- 40) Weber, M. W., D. K. Hoffman, and C. M. Hrenya, “Discrete-particle simulations of cohesive granular flow using a square-well potential,” *Granular Matter*, **6**, 239-254 (2004).
- 41) Dahl, S. R. and C. M. Hrenya, “Size Segregation in Rapid, Granular Flows with Continuous Size Distributions,” *Physics of Fluids*, **16**, 1-13 (2004).
- 42) Dahl, S. R., R. Clelland, and C. M. Hrenya, “Three-dimensional, Rapid Shear Flow of Particles with Continuous Size Distributions,” *Powder Technology*, **138**, 7-12 (2003); this work was 1 of 20 conference papers at the 4<sup>th</sup> World Congress of Particle Technology, Sydney, 2002 (of over 400 contributions total) invited to appear in special issue of *Powder Technology*.
- 43) Dahl, S. R., C. M. Hrenya, V. Garzó, and J. W. Dufty, “Kinetic Temperatures for a Granular Mixture,” *Physical Review E*, **66**, art. no. 041301, 10 pages (2002).
- 44) Johnson, J. A., W. B. Krantz, C. M. Hrenya, and A. W. Weimer, “Sensitivity Analysis of the Rapid Carbothermal Reduction Synthesis of Ultra-Fine Silicon Carbide Powders,” *Journal of Aerosol Science and Technology*, **36**, 1087-1098 (2002).
- 45) Johnson, J. A., C. M. Hrenya, and A. W. Weimer, “Intrinsic Reaction and Self-Diffusion Kinetics for Silicon Carbide Synthesis by Rapid Carbothermal Reduction,” *Journal of the American Ceramic Society*, **85**, 2273-2280 (2002).
- 46) Dahl, S. R., R. Clelland, and C. M. Hrenya, “The Effects of Continuous Size Distributions on the Rapid Flow of Inelastic Particles,” *Physics of Fluids*, **14**, 1972-1984 (2002).
- 47) Clelland, R. and C. M. Hrenya, “Simulations of a Binary-sized Mixture of Inelastic Grains in Rapid Shear Flow,” *Physical Review E*, **65**, art. no. 031301, 9 pages (2002).

- 48) Alam, M. and C. M. Hrenya, "Inelastic Collapse in Simple Shear Flow of a Granular Medium," *Physical Review E*, **63**, art. no. 061308, 9 pages (2001).
- 49) Detamore, M. S., M. A. Swanson, K. R. Frender, and C. M. Hrenya, "A Kinetic-Theory Analysis of the Scale-up of Circulating Fluidized Beds," *Powder Technology*, **116**, 190-203 (2001).
- 50) Hrenya, C., S. Miller, T. Mallo and J. Sinclair, "Comparison of Low Reynolds Number k- $\epsilon$  Turbulence Models in Predicting Heat Transfer Rates for Pipe Flow," *International Journal of Heat and Mass Transfer*, **41**, 1543-1547 (1998).
- 51) Hrenya, C. M. and J. L. Sinclair, "The Role of Particle-Phase Turbulence in Gas-Solid Flows," *AIChE Journal*, **43**, 853-869 (1997).
- 52) Hrenya, C. M., E. J. Bolio, D. Chakrabarti and J. L. Sinclair, "Comparison of Low Reynolds Number k- $\epsilon$  Turbulence Models in Predicting Fully Developed Pipe Flow," *Chemical Engineering Science*, **50**, 1923-1941 (1995).

#### **INVITED LECTURES: ACADEMIA**

- 1) "Stokes' Cradle and Beyond: Using Toys to Probe the Physics of Wetted-particle Agglomeration," Arizona State University, School for Engineering of Matter, Transport and Energy (Apr 2011).
- 2) "Stokes' Cradle and Beyond: Using Toys to Probe the Physics of Wetted-particle Agglomeration," New Jersey Institute of Technology, Department of Mechanical and Industrial Engineering (Mar 2011).
- 3) "Landing Spacecraft on the Moon, Manufacturing Pills, and Feeding Chickens: What is the Common Thread?," Chancellor's CU Seminar, University of Colorado (Apr 2010).
- 4) "Exploring Wetted Particle Collisions with Stokes' Cradle," Max Planck Institute, Göttingen, Germany (Jun 2009).
- 5) "Newton's Cradle Undone: Experiments and Theory for Collisions between Wetted Solids," Department of Chemical and Petroleum Engineering, University of Pittsburgh (Dec 2008).
- 6) "Evidence of higher-order effects in thermally driven granular flows," The James Franck Institute, University of Chicago (Apr 2007).
- 7) "Cohesive Forces in Gas-Solid Flows," School of Chemical Engineering, Purdue University (Jan 2007).
- 8) "Transport Phenomena in Particulate Systems," Department of Chemical and Biological Engineering, University of Colorado (Dec 2006).
- 9) "Mixing and Segregation in Granular Flows," Department of Chemical Engineering, University of Florida (May 2006).

- 10) "The Effect of Size Distribution on a Clustering Instability in Granular Gases," Department of Chemical and Biochemical Engineering, Rutgers University (Sep 2005).
- 11) "On the Rheology of Solids with Nonuniform Size and/or Density," Department of Chemical Engineering, Illinois Institute of Technology (Apr 2004).
- 12) "On the Rheology of Solids with Nonuniform Size and/or Density," Department of Chemical Engineering, Carnegie Mellon University (Mar 2004).
- 13) "Observations on mixing and de-mixing in rapid flows of unlike particles," Sibley School of Mechanical and Aerospace Engineering, Cornell University (Oct 2003).
- 14) "Computational Tools to investigate the Flow Behavior of Particulate Systems," Department of Applied Mathematics, University of Colorado (Mar 2003).
- 15) "Toward an Understanding of the Effects of Polydispersity in Particulate Flows," Department of Chemical Engineering, Lehigh University (Oct 2002).
- 16) "Rheology of Rapid Flows with Multi-sized or Cohesive Grains," Department of Chemistry, Iowa State University (Oct 2001).
- 17) "Molecular-Dynamics Simulations of Rapid Granular Flows and their Implications on the Kinetic Theory Approach," Ferroelectric Liquid Crystal Materials Research Center, Department of Physics, University of Colorado (Dec 2000).
- 18) "Molecular-Dynamics Simulations of Rapid Granular Flows and their Implications on the Kinetic Theory Approach," School of Chemical Engineering, Purdue University (Sep 2000).
- 19) "Effects of Scale-Up and Polydispersity in Fluidized Gas-Solid Systems," Department of Mechanical Engineering, Iowa State University (Mar 2000).
- 20) "Modeling and Scale-Up of High-Velocity, Gas-Solid Systems," Department of Chemical Engineering, Colorado State University (Oct 1999).
- 21) "The Flow Behavior of Massive Particles: Explainable and (currently) Unexplainable Phenomena," Institute of Process Engineering, ETH, Zurich (Jul 1999).
- 22) "On the Effects of Particle-Phase Turbulence in Dense Gas-Solid Flows," Department of Applied Mathematics, University of Colorado (Sep 1998).
- 23) "On the Effects of Particle-Phase Turbulence in Dense Gas-Solid Flows," Department of Chemical Engineering, University of Houston (Mar 1998).
- 24) "On the Effects of Particle-Phase Turbulence in Dense Gas-Solid Flows," Department of Chemical Engineering, University of Colorado (Feb 1998).
- 25) "On the Effects of Particle-Phase Turbulence in Dense Gas-Solid Flows," Department of Chemical Engineering, The Ohio State University (Feb 1998).

- 26) "Predicting Dense Gas-Solid Flows in Vertical Tubes," Department of Chemical and Environmental Engineering, University of Arizona (Feb 1996).
- 27) "The Role of Particle-Phase Turbulence in Dense Gas-Solid Flows," Department of Chemical Engineering and Materials Science, University of Minnesota (Jan 1996).

#### **INVITED LECTURES: CONFERENCES AND WORKSHOPS**

- 1) "Polydisperse Gas-Solid Fluidization: Segregation, Bubbles, and Clusters," 6<sup>th</sup> Sino-U.S. Chemical Engineering Conference, Beijing, China (to be presented in Nov 2011).
- 2) "Experiments in Gas-Solid Fluidized Beds using Continuous Particle Size Distributions," ZCAM Workshop on Granular and Active Fluids, Zaragoza, Spain (to be presented in Sep 2011).
- 3) "Segregation in Rapid Flows: Continuum and DEM," Granular Flows Summer School, University of Maryland, MD (to be presented in Jun 2011).
- 4) "Role of Collisions in Erosion of Lunar Regolith," Workshop on Lunar and Martian Plume Effects, Kennedy Space Center, Florida (Jan 2011).
- 5) "Experiments and Model Development for Polydisperse, Gas-Fluidized Systems," NETL 2010 Workshop on Multiphase Flow Science, Pittsburgh, PA (May 2010).
- 6) "Enskog-based Hydrodynamic Description of Gas-Solid Suspensions," Southern Workshop on Granular Materials, Vina del Mar, Chile (Dec 2009).
- 7) "Molecular Dynamics-Driven Transport Coefficients for Granular Flows: A Perspective," Festschrift Session for Professor Dimitri Gidaspow's 75th Birthday, Annual Meeting of the American Institute of Chemical Engineers, Nashville, TN (Nov 2009).
- 8) "Solids Processing of Biomass," Colorado Center for Biorefining and Biofuels (C2B2) Short Course, Fort Collins, CO (May 2009).
- 9) "Kinetic Theory of Polydisperse Granular Flows and Validation Data," DOE NETL Workshop on Multiphase Flow Science, Morgantown, WV (Apr 2009).
- 10) "Continuum Theory for Collision-Based, Granular Flows with Continuous Size Distributions," Workshop on Lunar and Martian Plume Effects, Kennedy Space Center, Florida (Oct 2008).
- 11) "On the Description of Granular Flows with a Continuous Size Distribution," Granular Gases 2008, Thorneau, Germany (Sep 2008).
- 12) "Agglomeration and De-agglomeration in Wetted, Particulate Systems," Gordon Research Conference on Granular and Granular-fluid Flows, Waterville, Maine (Jun 2008).
- 13) "Agglomeration of Wetted Particulates," Granular Flows: A Proving Ground for Nonequilibrium Statistical Mechanics, Sevilla, Spain (Sep 2007).
- 14) "Beyond Navier-Stokes Order Effects in Granular Gases," APS March Meeting, Denver, CO (Mar 2007).



- 15) "Assessment of Heat Flux Laws in Thermally-Driven Granular Gases," Southern Workshop on Granular Materials, Vina del Mar, Chile (Sep 2006).
- 16) "Impact of Non-uniform Size Distribution on Clustering in Rapid Granular Flows," Gordon Conference on Engineering Sciences for Space Exploration, Les Diablerets, Switzerland (Aug 2005).
- 17) "Segregation and Non-equipartition Phenomena in Hard-Sphere Mixtures," Granular Physics Workshop, Kavli Institute for Theoretical Physics, University of California at Santa Barbara (May 2005).
- 18) "Discrete-Element Modeling (DEM) of Solids Flows," Summer School in Winter, Particle Science & Technology ERC, University of Florida (Jan 2005).
- 19) "Computational Findings for Polydisperse Granular Flows and their Implications," CECAM Workshop – Experimentalist-Modeling Interactions: New Trends on Modeling Granular Flows, Lyon, France (Jun 2004).
- 20) "Discrete-Element Modeling (DEM) of Solids Flows," Summer School in Winter, Particle Science & Technology ERC, University of Florida (Jan 2004).
- 21) "Recent findings for particulate flows undergoing species segregation," Multiphase Fluid Dynamics Research Consortium Meeting, Ann Arbor, MI (Jun 2003).
- 22) "Bridging the gap between flows of light and massive particles (from aerosols to grains)," NASA Office of Biological and Physical Research – Workshop on Fine Particulates, NASA Glenn Research Center (May 2003).
- 23) "Ongoing Research Efforts in Granular Flows and Aerosols," NASA Office of Biological and Physical Research – Workshop on Fine Particulates, NASA Glenn Research Center (May 2003).
- 24) "Discrete-Element Modeling (DEM) of Solids Flows," Summer School in Winter, Particle Science & Technology ERC, University of Florida (Jan 2003).
- 25) "2D or not 2D: That is the Question," Multiphase Fluid Dynamics Research Consortium Meeting, Baltimore, MD (Sep 2002).
- 26) "A Critical Assessment of the Equipartition-of-Energy Assumption in Particle Flows," Multiphase Fluid Dynamics Research Consortium Meeting, West Lafayette, IN (Apr 2002).
- 27) "Rapid Granular Flows: A Comparison of DEM and Kinetic-Theory Predictions for Complex Systems," Department of Energy GLUE Workshop, Argonne National Laboratory, Chicago, IL (Mar 2002).
- 28) "Discrete-Element Modeling (DEM) of Solids Flows," Summer School in Winter, Particle Science & Technology ERC, University of Florida (Jan 2002).

- 29) “On the Simulation of Flows composed of Inelastic, Cohesive Solids,” Multiphase Fluid Dynamics Research Consortium Meeting, Salt Lake City, UT (Aug 2001).
- 30) “Molecular-Dynamics Simulations of Grains with a Distribution of Sizes,” Multiphase Fluid Dynamics Research Consortium Meeting, Morgantown, WV (Apr 2001).
- 31) “The Impact of Continuous Size Distributions on Stresses in Granular Shear Flows,” Multiphase Fluid Dynamics Research Consortium Meeting, Midland, MI (Oct 2000).
- 32) “Effects of Polydispersity on Granular Shear Flows,” Particles and Beyond: 2000 Workshop, Colorado School of Mines (May 2000).
- 33) “Effects of Polydispersity on Granular Shear Flows,” Multiphase Fluid Dynamics Research Consortium Meeting, Albuquerque, NM (Apr 2000).

**INVITED LECTURES: INDUSTRY AND NATIONAL LABORATORIES**

- 1) “An Overview of Modeling Activities for Solids Flows,” Hemlock Semiconductor Corporation, Midland, MI (Mar 2011).
- 2) “Agglomeration and De-agglomeration of Wetted Particles: Stokes’s Cradle and Beyond,” Bristol-Myers Squibb, New Brunswick, NJ (Sep 2010).
- 3) “Benefits and Shortfalls of Modeling Tools for Solids Flows,” UOP / Honeywell Invitational Lecture Series, Chicago, IL (May 2009).
- 4) “Kinetic Theory of Polydisperse, Granular Flow and Validation Experiments,” Department of Energy NETL, Morgantown, WV (Apr 2008).
- 5) “Development, Verification, and Validation of Multiphase Models for Polydisperse Flows,” Department of Energy NETL, Morgantown, WV (May 2007).
- 6) “Overview of Kinetic Theory Analogy for Solids Flows,” Arena-flow, Albuquerque, NM (Jan 2005).
- 7) “MFI Simulations of Fluidized Beds with Polydisperse or Cohesive Materials,” Department of Energy NETL, Morgantown, WV (Mar 2004).
- 8) “Rheology of Rapid Flows with Multi-sized or Cohesive Grains,” NASA Glenn Research Center, Cleveland, OH (Aug 2001).
- 9) “Clustering in Dense Gas-Solid Flows,” NASA Glenn Research Center, Cleveland, OH (Aug 2001).
- 10) “On the Simulation of Flows composed of Inelastic, Cohesive Solids,” Ames Laboratory, Iowa State University, IA (Jun 2001).
- 11) “On Two Phenomena of Particulate Flows: Thermophoresis in Aerosols and Polydispersity in Granular Systems,” Millennium Inorganic Chemicals, Research Center, Baltimore, MD (Mar 2001).

- 12) "Effects of Scale-Up and Polydispersity in Fluidized Gas-Solid Systems," Ames Laboratory, Iowa State University (Mar 2000).
- 13) "Effects of Scale-Up and Polydispersity in Fluidized Gas-Solid Systems," Millennium Inorganic Chemicals, Research Center, Baltimore, MD (Feb 2000).
- 14) "On the Effects of Particle-Phase Turbulence in Dense Gas-Solid Flows," Exxon Production Research, Reservoir Division, Houston, TX (Feb 1998).
- 15) "On the Effects of Particle-Phase Turbulence in Dense Gas-Solid Flows," Shell Development Co., Fluid Mechanics / Reaction Engineering, Houston, TX (Feb 1998).
- 16) "On the Effects of Particle-Phase Turbulence in Dense Gas-Solid Flows," Cargill Research, Wayzata, MN (Feb 1998).
- 17) "On the Effects of Particle-Phase Turbulence in Dense Gas-Solid Flows," Exxon Chemical Company, Basic Chemicals Division, Baytown, TX (Jan 1998).
- 18) "Fundamental Modeling of Gas-Solid Flows," Pittsburgh Energy Technology Center, Department of Energy, Pittsburgh, PA (Sep 1995).
- 19) "CFD Modeling of Gas-Particle Systems," The Dow Chemical Company, Midland, MI (Jun 1995).
- 20) "Predicting the Hydrodynamic Behavior of Dense-Phase Flows," The Dow Chemical Company, Midland, MI (Oct 1994)

#### **INVITED LECTURES: MISCELLENAEUS**

- 1) "(Not) everything you ever (did not) wanted to know about being a faculty member..." University of Colorado GAANN Retreat, Winter Park, CO (Nov 2002)
- 2) "Chemical Engineering as a Career," Strongsville High School, Strongsville, OH (Jan 1995).

#### **CONFERENCE PROCEEDINGS (PEER-REVIEWED)**

- 1) Galvin, J. E., S. R. Dahl, and C. M. Hrenya, "The Effect of a Non-Equipartition of Energy on the Separation of Multi-Component Flows," *Materials Research Society Symposium Proceedings*, **759**, Boston, MA (Dec 2002).
- 2) Dahl, S. R., R. Clelland, and C. M. Hrenya, "Three-dimensional, Rapid Shear Flow of Particles with Continuous Size Distributions," *Proceedings of the World Congress on Particle Technology 4*, Sydney, Australia (Jul 2002).
- 3) Weber, M. W., C. M. Hrenya, and D. K. Hoffman, "Discrete-Particle Simulation of Cohesive, Inelastic Grains in Simple Shear Flow," *Proceedings of the World Congress on Particle Technology 4*, Sydney, Australia (Jul 2002).

- 4) Alam, M., R. Clelland, and C. Hrenya “Effects of Polydispersity on Stresses in Granular Shear Flow,” *Materials Research Society Symposium Proceedings*, **627**, San Francisco, CA (Apr 2000).

#### CONFERENCE PROCEEDINGS (NON-REFEREED)

- 1) Chew, J. W., C. M. Hrenya, R. A. Cocco, J. G. Findlay, S. B. R. Karri, T. M. Knowlton, “Observations of reverse core-annular flow in risers with Geldart group B particles,” *Proceedings of the Sixth World Congress of Particle Technology 6*, Nuremberg, Germany (Apr 2010).
- 2) Leboreiro, J., G. G. Joseph, C. M. Hrenya, D. M. Snider, and S. S. Banerjee, “The Influence of Binary Drag Laws on MP-PIC Simulations of Segregation,” *Proceedings of the Fifth World Congress on Particle Technology*, Orlando, FL (Apr 2006).
- 3) Joseph, G. G., J. Leboreiro, C. M. Hrenya, M. Lehr, H. Woods, S. S. Banerjee, and D. Snider, “Experimental Verification of Drag Laws for Binary, Gas-fluidized Systems,” *Proceedings of the Fifth World Congress on Particle Technology*, Orlando, FL (Apr 2006).
- 4) Weber, M. W., D. K. Hoffman, and C. M. Hrenya, “Simulation of Cohesive Forces in Rapid Granular Flow Using A Square-Well Potential,” *Proceedings of the AIChE Annual Meeting: Particle Technology Forum*, San Francisco, CA (Nov 2003).
- 5) Dahl, S. R. and C. M. Hrenya, “Size Segregation of Particulate Mixtures with Lognormal Size Distributions,” *Proceedings of the AIChE Annual Meeting: Particle Technology Forum*, San Francisco, CA (Nov 2003).
- 6) Galvin, J. E., S. R. Dahl, and C. M. Hrenya, “Analysis of Driving Forces for Segregation in a Granular Mixture,” *Proceedings of the AIChE Annual Meeting: Particle Technology Forum*, San Francisco, CA (Nov 2003).
- 7) Dahl, S. R., R. Clelland, and C. M. Hrenya, “The Simple Shear Flow of Granular Materials with Lognormal Particle Size Distributions,” *Proceedings of the AIChE Annual Meeting: Particle Technology Forum*, Reno, NV (Nov 2001).
- 8) Alam, M., R. Clelland, and C. Hrenya, “Simple Shear Flow of Granular Materials with a Smooth Size Distribution,” *Proceedings of the AIChE Annual Meeting: Fourth International Particle Technology Forum*, Los Angeles, CA (Nov 2000).
- 9) Walsh, J., S. Dahl, A. Weimer, S. Pratsinis and C. Hrenya, “The Effects of Buoyancy on Thermophoretic Deposition of Aerosol Particles in a Laminar, Vertical Flow,” *Proceedings of the AIChE Annual Meeting: Fourth International Particle Technology Forum*, Los Angeles, CA (Nov 2000).
- 10) Swanson, M., M. Detamore, and C. Hrenya “Effects of Particle Collisions on the Scaling of Fluidized Systems,” *Proceedings of the Third Israeli Conference for Conveying and Handling of Particulate Solids*, Dead Sea, Israel (May 2000).

- 11) Detamore, M., K. Frender, M. Swanson, and C. Hrenya “Scale-Up of High-Velocity Gas-Solid Systems: A Comparison between Kinetic-Theory Modeling and Existing Scaling Laws,” *Proceedings of the AIChE Annual Meeting: Fluidization and Fluid-Particle Systems*, Dallas, TX (Nov 1999).
- 12) Hrenya, C. M. and J. L. Sinclair, "Predicting Dense, Turbulent Gas-Particle Flows," *Proceedings of the 10th ASCE Engineering Mechanics Specialty Conference*, Boulder, CO (May 1995).

**CONTRIBUTED CONFERENCE PRESENTATIONS** (speaker underlined)

- 1) Donahue, C. M., C. M. Hrenya, R. H. Davis, and W. M. Brewer, “Stokes’ cradle: Oblique collisions between Wetted Particles,” 63<sup>rd</sup> Annual Meeting of American Physical Society Division of Fluid Dynamics, Long Beach, CA (Nov 2010).
- 2) Donahue, C. M., C. M. Hrenya, and R. H. Davis, “Oblique Collisions Between Wetted Particles,” Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (Nov 2010).
- 3) Brewer, W., C. M. Donahue, C. M. Hrenya, “Stokes' Cradle: Oblique Collisions of Two Solid Particles with a Fluid Layer (poster),” Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (Nov 2010).
- 4) Cromer, D. J., S. R. Dahl, P. P. Mitrano, M. S. Pacella, and C. M. Hrenya, “Predicting the Critical Length Scale for Clustering Instabilities in the Homogenous Cooling of Inelastic Particles,” Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (Nov 2010).
- 5) Chew, J. W. and C. M. Hrenya, “Linking Bubble Characteristics and Species Segregation in Bubbling Gas-Fluidized Beds,” Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (Nov 2010).
- 6) Holloway, W., S. Benyahia, C. M. Hrenya, and S. Sundaresan, “Meso-Scale Structures in Binary Gas-Solid Suspension Flows,” Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (Nov 2010).
- 7) Anand, A., C. M. Hrenya, and P. Metzger, “Predicting Erosion Dynamics of Regolith During Lunar Landing Using the Discrete Element Method (DEM),” Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (Nov 2010).
- 8) Murray, J. A., C. M. Hrenya and V. Garzo, “Extension of Kinetic Theory for Granular Binary Mixtures to Moderately Dense Flows,” Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (Nov 2010).
- 9) Chew, J. W., C. M. Hrenya, R. A. Cocco, R. C. Hays, J. G. Findlay, S. B. R. Karri, and T. M. Knowlton, “Observation of Reverse Core-Annulus Behavior in Risers and Its

- Relation to Stokes Number,” Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (Nov 2010).
- 10) Anand, A., C. M. Hrenya and P. T. Metzger, “Predicting erosion dynamics of regolith during lunar landing using the discrete element method (poster),” Gordon Research Conference on Granular and Granular-fluid Flows, Waterville, ME (Jun 2010).
  - 11) Donahue, C. M., C. M. Hrenya, R. H. Davis, and W. M. Brewer, “Oblique wetted particle-particle collisions (poster),” Gordon Research Conference on Granular and Granular-fluid Flows, Waterville, ME (Jun 2010).
  - 12) Chew, J., J. Wolz, and C. M. Hrenya, “Linking bubbling and species segregation patterns in low-velocity fluidized beds (poster),” NETL 2010 Workshop on Multiphase Flow Science, Pittsburgh, PA (May 2010).
  - 13) Cocco, R., J. Chew, C. Hrenya, R. Hays, R. Kerri, T. Knowlton, “Measurement and Analysis of the Gas-Solid Hydrodynamics of Geldart Group B Powders in a 12-inch Diameter by 60-foot tall CFB,” NETL 2010 Workshop on Multiphase Flow Science, Pittsburgh, PA (May 2010).
  - 14) Subramaniam, S., S. Tenneti, R. Garg, K. Devendran, M. Mehrabadi, R. Fox and C. M. Hrenya, “Interaction of Particles with Carrier Gas revealed by Particle-resolved Direct Numerical Simulation: Improved Drag Laws and Models,” NETL 2010 Workshop on Multiphase Flow Science, Pittsburgh, PA (May 2010).
  - 15) Holloway, W., S. Benyahia, C. M. Hrenya and S. Sundaresan, “Mesoscale Structures in Bidisperse Fluidized Suspension,” NETL 2010 Workshop on Multiphase Flow Science, Pittsburgh, PA (May 2010).
  - 16) Chew, J. W., C. M. Hrenya, R. A. Cocco, J. G. Findlay, S. B. R. Karri, T. M. Knowlton, “Observations of reverse core-annular flow in risers with Geldart group B particles,” Sixth World Congress of Particle Technology 6, Nuremberg, Germany (Apr 2010).
  - 17) Passalacqua, A., J. E. Galvin, P. Vedula, C. M. Hrenya, R. O. Fox, “A quadrature-based kinetic model for a dilute non-isothermal granular gas,” 62<sup>nd</sup> Annual Meeting of American Physical Society Division of Fluid Dynamics, Minneapolis, MN (Nov 2009).
  - 18) Tenneti, S., R. Garg, C. M. Hrenya, R. O. Fox, S. Subramaniam, “Particle acceleration model for gas-solid suspensions at moderate Reynolds number,” 62<sup>nd</sup> Annual Meeting of American Physical Society Division of Fluid Dynamics, Minneapolis, MN (Nov 2009).
  - 19) Pacella, M., D. Cromer, and C. M. Hrenya, “Determination of a Critical Length Scale for Clustering Instability in Granular Systems (poster),” Annual Meeting of the American Institute of Chemical Engineers, Nashville, TN (Nov 2009).

- 20) Passalacqua, A., P. Vedula, C. M. Hrenya, R. O. Fox, “A Kinetic Model for a Non-Isothermal Granular Gas with Bi-Disperse Particles,” Annual Meeting of the American Institute of Chemical Engineers, Nashville, TN (Nov 2009).
- 21) Rice, R. B., C. M. Hrenya, “Impact of Binary and Continuous Particle Size Distributions On Clustering, Granular Shear Flows,” Annual Meeting of the American Institute of Chemical Engineers, Nashville, TN (Nov 2009).
- 22) Chew, J., C. M. Hrenya, R. A. Cocco, J. G. Findlay, T. M. Knowlton, “Riser-Flow Measurements of Polydisperse Geldart Group B Particles,” Annual Meeting of the American Institute of Chemical Engineers, Nashville, TN (Nov 2009).
- 23) Chew, J., J. Wolz, C. M. Hrenya, “Axial Segregation in Bubbling, Gas-Fluidized Beds with Continuous Size Distributions,” Annual Meeting of the American Institute of Chemical Engineers, Nashville, TN (Nov 2009).
- 24) Chew, J., J. Wolz, C. M. Hrenya, “Experiments on the Local Segregation Patterns of Gas-Fluidized Beds with Continuous Size Distributions (poster),” Powders & Grains 2009, Golden, CO (Jul 2009).
- 25) Donahue, C. M., C. M. Hrenya, R. H. Davis, “Stokes Cradle: Wetted Particle Collisions (poster),” Powders & Grains 2009, Golden, CO (Jul 2009).
- 26) Donahue, C. M., C. M. Hrenya, R. H. Davis, “The Underlying Physics in Wetted Particle Collisions,” 61<sup>st</sup> Annual Meeting of American Physical Society Division of Fluid Dynamics, San Antonio, TX (Nov 2008).
- 27) Viswanathan, H., C. M. Hrenya, R. O. Fox, “Representation of a Continuous Particle Size Distribution Using a New Polydisperse Kinetic Theory,” Annual Meeting of the American Institute of Chemical Engineers, Philadelphia, PA (Nov 2008).
- 28) Passalacqua, A., P. Vedula, C. M. Hrenya, R. O. Fox, “A Kinetic-Based Model for a Non-Isothermal Granular Gas with Mono- and Bi-Dispersed Particles,” Annual Meeting of the American Institute of Chemical Engineers, Philadelphia, PA (Nov 2008).
- 29) Donahue, C. M., C. M. Hrenya, K. Nakagawa, A. Zelinskaya, “Newton's Cradle Undone: Experiments and Collision Models for the Normal Collision of Three Solid Spheres,” Annual Meeting of the American Institute of Chemical Engineers, Philadelphia, PA (Nov 2008).
- 30) Donahue, C. M., C. M. Hrenya, G. G. Joseph, R. H. Davis, A. Zelinskaya, K. Nakagawa, “Using Stokes Cradle to Investigate Collisions Between Three Wetted Particles,” Annual Meeting of the American Institute of Chemical Engineers, Philadelphia, PA (Nov 2008).
- 31) Donahue, C. M., C. M. Hrenya, G. G. Joseph, R. H. Davis, K. Nakagawa, A. Pavlovna, “Using Newton’s Cradle to explore Wetted, 3-Particle Collisions,” XVth International Congress on Rheology, Monterey, CA (Aug 2008).

- 32) Joseph, G. G., C. M. Hrenya, and J. Kozlowski, "Linking Radial Species Segregation and Bubbling Patterns in Gas-Fluidized Beds," 60<sup>th</sup> Annual Meeting of American Physical Society Division of Fluid Dynamics, Salt Lake City, UT (Nov 2007).
- 33) Hrenya, C. M., J. E. Galvin, and R. D. Wildman, "Burnett-Order Effects and Beyond In Granular Flows Driven by a Thermal Gradient," Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (Nov 2007).
- 34) Galvin, J. E., J. Leboeiro, C. M. Hrenya, and S. Benyahia, "Influence Of The Kinetic Theory Model On Segregation Of Gas-Solid Systems With Binary Mixtures," Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (Nov 2007).
- 35) Garzó, V., J. W. Dufty, and C. M. Hrenya, "A New Kinetic-Theory-Based Model For Granular Flows With Size And/or Density Differences," Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (Nov 2007).
- 36) Galvin, J. E., C. M. Hrenya, and R. D. Wildman, "Knudsen Boundary Layer in Granular Systems," Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA (Nov 2006).
- 37) Leboeiro, J., G. G. Joseph, and C. M. Hrenya, "Revisiting the Standard Drag Law for Bubbling, Gas-Fluidized Beds," Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA (Nov 2006).
- 38) Joseph, G. G., J. Leboeiro, and C. M. Hrenya, and R. D. Wildman, "The Effect of Drag Laws on the Prediction of Fluidized Bed Bubbling," Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA (Nov 2006).
- 39) Galvin, J. E., C. M. Hrenya, and R. D. Wildman, "Role of Knudsen Layer in Granular Systems (poster)," Gordon Research Conference on Granular and Granular-fluid Flows, Oxford, UK (Jul 2006).
- 40) Hrenya, C. "Cohesive Particulate Systems - Micro-scale to Macro-scale Analysis (poster)," 27<sup>th</sup> Annual Meeting of the International Fine Particulate Research Institute, Santa Barbara, CA (Jun 2006).
- 41) Leboeiro, J., G. G. Joseph, C. M. Hrenya, D. M. Snider, and S. S. Banerjee, "The Influence of Binary Drag Laws on MP-PIC Simulations of Segregation," Fifth World Congress on Particle Technology, Orlando, FL (Apr 2006).
- 42) Joseph, G. G., J. Leboeiro, C. M. Hrenya, M. Lehr, H. Woods, S. S. Banerjee, and D. Snider, "Experimental Verification of Drag Laws for Binary, Gas-fluidized Systems," Fifth World Congress on Particle Technology, Orlando, FL (Apr 2006).



- 43) Rice, R. B. and C. M. Hrenya, "Impact of a Binary Size Distribution on the Clustering Instability," 58<sup>th</sup> Annual Meeting of American Physical Society Division of Fluid Dynamics, Chicago, IL (Nov 2005).
- 44) Kantak, A. A., R. H. Davis, and C. M. Hrenya, "Modeling of Wet Particle Collisions and its Application to Dilute Wet Particle Systems", Annual Meeting of the American Institute of Chemical Engineers, Cincinnati, OH (Nov 2005).
- 45) Hrenya, C. M. and M. W. Weber, "Using Cohesion Models to Explain Pressure Overshoot in Gas-Solid Fluidized Beds," Granular Physics Conference, Kavli Institute for Theoretical Physics, University of California at Santa Barbara (Jun 2005).
- 46) Galvin, J. E., S. R. Dahl, and C. M. Hrenya, "Segregation Driving Forces in Granular Mixtures," 57<sup>th</sup> Annual Meeting of American Physical Society Division of Fluid Dynamics, Seattle, WA (Nov 2004).
- 47) Dahl, S. R. and C. M. Hrenya, "Size Segregation in Gas-Solid Fluidized Beds with Continuous Size Distributions," Annual Meeting of the American Institute of Chemical Engineers, Austin, TX (Nov 2004).
- 48) Walsh, J. K., A. W. Weimer, and C. M. Hrenya, "Thermophoretic Deposition Patterns of Aerosol Particle in Tube Flow with Mixed Convection," Annual Meeting of the American Institute of Chemical Engineers, Austin, TX (Nov 2004).
- 49) Weber, M. W. and C. M. Hrenya, "Simulation of Cohesive Forces in Fluidized Bed," Annual Meeting of the American Institute of Chemical Engineers, Austin, TX (Nov 2004).
- 50) Galvin, J. E., S. R. Dahl, and C. M. Hrenya, "Species Segregation Driven by a Granular Temperature Gradient," 21<sup>st</sup> International Congress of the International Union of Theoretical and Applied Mechanics, Warsaw, Poland (Aug 2004).
- 51) Galvin, J. E., S. R. Dahl, and C. M. Hrenya, "Species Segregation of a Granular Mixture (poster)," 2004 Gordon Conference on Granular and Granular-Fluid Flow (Jun 2004).
- 52) Dahl, S. R. and C. M. Hrenya, "Mixing Characteristics of Continuous Size Distributions in Presence of Granular Temperature Gradient," 56<sup>th</sup> Annual Meeting of American Physical Society Division of Fluid Dynamics, East Rutherford, NJ (Nov 2003).
- 53) Weber, M. W., D. K. Hoffman, and C. M. Hrenya, "Simulation of Cohesive Forces in Rapid Granular Flow Using A Square-Well Potential," Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA (Nov 2003).
- 54) Dahl, S. R. and C. M. Hrenya, "Size Segregation of Particulate Mixtures with Lognormal Size Distributions," Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA (Nov 2003).

- 55) Galvin, J. E., S. R. Dahl, and C. M. Hrenya, "Analysis of Driving Forces for Segregation in a Granular Mixture," Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA (Nov 2003).
- 56) Crawford, L. E., C. M. Hrenya, and J. E. Colwell, "Low Velocity Collisions into Regolith: Simulation vs. Experiment (poster)," Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA (Nov 2003).
- 57) Weber, M. W., D. K. Hoffman, and C. M. Hrenya, "Simulation of Rapid Granular Flow with Cohesive Forces Using a Square-Well Potential (poster)," Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA (Nov 2003).
- 58) Dahl, S. R. and C. M. Hrenya, "Size Segregation of Granular Mixtures with Lognormal Size Distributions (poster)," Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA (Nov 2003).
- 59) Galvin, J. E., S. R. Dahl, and C. M. Hrenya, "Investigation of the Driving Forces for Segregation in Granular Mixtures (poster)," Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA (Nov 2003).
- 60) Hrenya, C. M., "The Effect of a Non-Equipartition of Energy on the Separation of Multicomponent Flows," Materials Research Society Fall Meeting, Boston, MA (Dec 2002).
- 61) Dahl, S. R. and C. M. Hrenya, "Size Segregation of Particulate Mixtures with Gaussian Size Distributions," Annual Meeting of the American Institute of Chemical Engineers, Indianapolis, IN (Nov 2002).
- 62) Galvin, J. E., S. R. Dahl and C. M. Hrenya, "On the Common Assumptions in the Kinetic Theory of Granular Mixtures," Annual Meeting of the American Institute of Chemical Engineers, Indianapolis, IN (Nov 2002).
- 63) Walsh, J. K., K. Buechler, A. Weimer, S. E. Pratsinis, and C. M. Hrenya, "The Effect of Buoyancy on Thermophoretic Deposition Patterns of Aerosol Particles in Laminar, Vertical Tube Flow," Annual Meeting of the American Institute of Chemical Engineers, Indianapolis, IN (Nov 2002).
- 64) Rice, R. B. and C. M. Hrenya, "A Characterization Method for Clusters in Multi-sized Particulate Systems (poster)," Annual Meeting of the American Institute of Chemical Engineers, Indianapolis, IN (Nov 2002).
- 65) Dahl, S. R., R. Clelland, and C. M. Hrenya, "Three-dimensional, Rapid Shear Flow of Particles with Continuous Size Distributions," World Congress on Particle Technology 4, Sydney, Australia (Jul 2002).

- 66) Weber, M. W., C. M. Hrenya, and D. K. Hoffman, "Discrete-Particle Simulation of Cohesive, Inelastic Grains in Simple Shear Flow," World Congress on Particle Technology 4, Sydney, Australia (Jul 2002).
- 67) Hrenya, C. M., "Modeling Assumptions in Rapid Flows of Binary-Sized Mixtures (poster)," Gordon Research Conference on Granular and Granular-Fluid Flow, Plymouth, NH (Jul 2002).
- 68) Dahl, S. R., R. Clelland, and C. M. Hrenya, "The Simple Shear Flow of Granular Materials with Lognormal Particle Size Distributions," Annual Meeting of the American Institute of Chemical Engineers, Reno, NV (Nov 2001).
- 69) Alam, M., R. Clelland, and C. Hrenya, "Simple Shear Flow of Granular Materials with a Smooth Size Distribution," Annual Meeting of the American Institute of Chemical Engineers, Los Angeles, CA (Nov 2000).
- 70) Walsh, J., S. Dahl, A. Weimer, S. Pratsinis and C. Hrenya, "The Effects of Buoyancy on Thermophoretic Deposition of Aerosol Particles in a Laminar, Vertical Flow," Annual Meeting of the American Institute of Chemical Engineers, Los Angeles, CA (Nov 2000).
- 71) Hrenya, C. M., M. Alam, and R. Clelland, "Observations of Inelastic Collapse in Granular Shear Flow," 20<sup>th</sup> International Congress of the International Union of Theoretical and Applied Mechanics, Chicago, IL (Aug 2000).
- 72) Dahl, S., M. Alam, R. Clelland, and C. Hrenya, "Polydisperse Granular Shear Flows: A Comparison between Discrete-Element Simulation and Theory (poster)," United Engineering Foundation Conference on Chemical Reaction Engineering VII: Computational Fluid Dynamics", Quebec City, Canada, (Aug 2000).
- 73) Clelland, R. B., C. M. Hrenya, and M. Alam, "Polydisperse Effect on Clustering in Granular Systems," Third SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, PA (May 2000).
- 74) Swanson, M., M. Detamore, and C. Hrenya, "Effects of Particle Collisions on the Scaling of Fluidized Systems," Third Israeli Conference for Conveying and Handling of Particulate Solids, Dead Sea, Israel (May 2000).
- 75) Alam, M., R. Clelland, and C. Hrenya, "Effects of Polydispersity on Stresses in Granular Shear Flow," Materials Research Society Spring Meeting, San Francisco, CA (Apr 2000).
- 76) Detamore, M., K. Frender, M. Swanson, and C. Hrenya, "Scale-Up of High-Velocity Gas-Solid Systems: A Comparison between Kinetic-Theory Modeling and Existing Scaling Laws," Annual Meeting of the American Institute of Chemical Engineers, Dallas, TX (Nov 1999).

- 77) Weimer, A., J. Johnson, and C. Hrenya, "Modeling and Simulation of the Rapid Carbothermal Reduction Synthesis of Ultra-Fine Silicon Carbide Powders," Annual Meeting of the American Institute of Chemical Engineers, Dallas, TX (Nov 1999).
- 78) Braun, M. W., D. E. Rivera, A. Stenman, W. Foslien, and C. Hrenya, "Multi-level pseudo-random signal design and 'model-on-demand' estimation applied to nonlinear identification of a RTP wafer reactor," American Control Conference, San Diego, CA (Jun 1999).
- 79) Hrenya, C. M. and J. L. Sinclair, "Describing the Hydrodynamic Behavior of Dense Gas-Solid Suspensions in Vertical Tubes," Twelfth Arizona Fluid Mechanics Conference, Tempe, AZ (Mar 1996).
- 80) Hrenya, C. M. and J. L. Sinclair, "The Role of Particle-Phase Turbulence in Dense Gas-Solid Flows," Annual Meeting of the American Institute of Chemical Engineers, Miami, FL (Nov 1995).
- 81) Hrenya, C. M. and J. L. Sinclair, "Predicting Dense, Turbulent Gas-Particle Flows," 10th ASCE Engineering Mechanics Specialty Conference, Boulder, CO (May 1995).
- 82) Hrenya, C. M. and J. Sinclair, "Predicting the Turbulent Pneumatic Transport of Massive Solids," Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA (Nov 1994).
- 83) Hrenya, C. M., E. Bolio, D. Chakrabarti and J. Sinclair, "Comparative Study of Low Reynolds Number Turbulence Models in Predicting Turbulent Pipe Flow," Annual Meeting of the American Institute of Chemical Engineers, St. Louis, MO (Nov 1993).

## FUNDING SOURCES

### "Toward the Quantitative Prediction of Instabilities in Granular Flows"

Role: PI  
Funding Agency: American Chemical Society – Petroleum Research Fund  
Amount: \$100,000  
Dates: Jan 2011 – May 2013

### "NSF-IFPRI Collaboratory in Dense Particulate Flow"

Role: co-PI  
Collaborators: Dr. Paul Mort, Proctor and Gamble (PI)  
Prof. Bob Berhinger, Duke University (co-PI)  
Dr. James Michaels, Merck (co-PI)  
Prof. Gaby Tardos, City College of New York (co-PI)  
Funding Agency: National Science Foundation – Chemical, Biological, Environmental, and Transport Systems (CBET)  
Amount: \$97,500  
Dates: May 2010 – Apr 2011

### "Erosion and Transport of Lunar Regolith by the Exhaust Plumes of Landing Spacecraft"

Role: co-PI  
Collaborators: Dr. Phil Metzger, NASA Kennedy Space Center (PI)

- Funding Agency: National Aeronautics and Space Administration – Lunar Advanced Science and Exploration Research (LASER) Program  
Amount: \$399,558  
Dates: Dec 2008 – Dec 2012
- “Segregation and Elutriation of a Binary Mixture”  
Role: PI  
Collaborators: Dr. Ray Cocco, PSRI (co-PI)  
Dr. Shibu Banerjee, Millennium Chemicals (co-PI)  
Funding Agency: National Science Foundation – Grant Opportunities for Academic Liaisons with Industry (GOALI) Program  
Amount: \$260,000 + \$6,000 REU supplement  
Dates: May 2007 – Apr 2011
- “Bridging the Scales of Wetted Particulate Flows: Experiment, Theory and Simulation”  
Role: co-PI  
Collaborators: Prof. Rob Davis, University of Colorado (PI)  
Funding Agency: Science Foundation – Chemical, Biological, Environmental, and Transport Systems (CBET)  
Amount: \$315,000 + \$12,000 REU supplement  
Dates: Apr 2008 – Dec 2011
- “Development, Verification, and Validation of Multiphase Models for Polydisperse Flows”  
Role: PI  
Collaborators: Dr. Ray Cocco, PSRI (co-PI)  
Prof. Rodney Fox, Iowa State University (co-PI)  
Prof. Shankar Subramaniam, Iowa State University (co-PI)  
Prof. Sankaran Sundaresan, Princeton University (co-PI)  
Funding Agency: Department of Energy – National Energy Technology Laboratory (NETL) Advanced Research (AR) Program  
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- “2009: Institute of Mathematics and its Applications (IMA) Workshop on Dense, Granular Flows”  
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Funding Agency: National Science Foundation  
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Dates: Sep 2008 – Aug 2009
- “Impact of Boundary on Knudsen Layer Thickness in Granular Flows”  
Role: PI  
Funding Agency: University of Colorado – Council for Research and Creative Work  
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Dates: May 2008 – Apr 2009
- “2006 Granular and Granular-fluid Flow Gordon Conference”  
Role: PI  
Funding Agency: National Science Foundation – Chemical Transport Systems (CTS)  
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Dates: Jun 2006
- “2006 Gordon Research Conference on Granular and Granular-fluid Flow”

Role: PI  
Funding Agency: Office of Naval Research Global  
Amount: \$10,000  
Dates: Feb 2006

“Mixing and Segregation in Polydisperse Granular Flows”

Role: co-PI  
Collaborators: Prof. Ricky Wildman, Loughborough University (PI)  
Funding Agency: Engineering and Physical Sciences Research Council, UK –  
Visiting Researcher Program  
Amount: \$75,000  
Dates: Oct 2005 – Mar 2006

“On the Description of Flows involving Polydisperse Solids”

Role: PI  
Funding Agency: American Chemical Society – Petroleum Research Fund  
Amount: \$80,000  
Dates: Sep 2005 – Aug 2007

“Wet Collisions in Granular Media”

Role: PI  
Collaborators: Prof. Rob Davis, University of Colorado (co-PI)  
Funding Agency: National Aeronautics and Space Administration  
Amount: \$186,394  
Dates: Apr 2005 – Sep 2007

“Micro-level and Macro-level Flow Mechanics of Wet Granular Media”

Role: PI  
Collaborators: Prof. Rob Davis, University of Colorado (co-PI)  
Funding Agency: National Science Foundation – Chemical Transport Systems (CTS)  
Amount: \$80,000 + \$6,000 REU supplement  
Dates: Mar 2005 – May 2008

“Toward a Fundamental Understanding of Elutriation in Fluidized Beds”

Role: PI  
Collaborators: Dr. Shibu Banerjee, Millennium Chemicals (co-PI)  
Dr. Dale Snider, Arena-flow (co-PI)  
Funding Agency: National Science Foundation – GOALI Program  
Amount: \$350,000 + \$5,000 REU supplement + \$10,500 international  
supplement  
Dates: Apr 2004 – Mar 2007

“Granular Flow and Kinetics”

Role: PI  
Funding Agency: Department of Energy – GLUE Program (subcontract from Ames  
Laboratory, Iowa State Univ.)  
Amount: \$25,000  
Dates: Jan 2003 – June 2003

“A Computationally Efficient Approach to the Lagrangian Modeling of Bubbling Beds”

Role: PI  
Funding Agency: National Science Foundation – Chemical Transport Systems (CTS)  
Amount: \$100,000

Dates: Nov 2002 – Oct 2004

“The Effect of a Non-Equipartition-of-Energy on the Size/Density Segregation in Rapid Granular Flows”

Role: PI  
Funding Agency: American Chemical Society – Petroleum Research Fund  
Amount: \$120,000  
Dates: Jun 2002 – Aug 2005

“A New Course on Particle Technology”

Role: PI  
Funding Agency: University of Colorado Engineering Excellence Fund  
Amount: \$16,558  
Dates: May 2002 – Apr 2003

“On the Appropriateness of 2D vs. 3D Simulations for Particulate Flows”

Role: PI  
Funding Agency: University of Colorado Council for Research and Creative Work  
Amount: \$4,200  
Dates: Dec 2001 – Nov 2002

“Graduate Program in Microparticle and Nanoparticle Technology”

Role: co-PI  
Collaborators: Prof. Rob Davis, University of Colorado (PI)  
Prof. Al Weimer, University of Colorado (co-PI)  
Funding Agency: Department of Education – GAANN Fellowship Program  
Amount: \$519,426  
Dates: Sep 2001 – Aug 2004

“Discrete-Particle Simulations of Granular Systems with Cohesive Particles”

Role: PI  
Funding Agency: Department of Energy - NETL (subcontract from Ames Laboratory, Iowa State University)  
Amount: \$53,902  
Dates: Apr 2001 – Dec 2002

“Inelastic Collapse in Rapid Granular Shear Flows”

Role: PI  
Funding Agency: American Chemical Society - Petroleum Research Fund  
Amount: \$25,000  
Dates: Sep 2000 – Aug 2002

Unrestricted Funding

Role: PI  
Funding Agency: Millennium Chemicals  
Amount: \$97,500  
Dates: Aug 2000 – Oct 2003

“Particle Technology Laboratory Modules”

Role: PI  
Funding Agency: University of Colorado Engineering Excellence Fund  
Amount: \$10,002  
Dates: Jun 2000 – May 2001

“Scale-Up of Fluidized Systems”

Role: PI  
Funding Agency: Big 12 Universities Fellowship Fund  
Amount: \$2,500  
Dates: Jan 2000 – Dec 2000

“Integration of Matlab PDE Toolbox in Chemical Engineering Curriculum”

Role: PI  
Funding Agency: University of Colorado Engineering Excellence Fund  
Amount: \$1,000  
Dates: Jan 2000 – Dec 2000

“Thermophoresis of Exothermically Reacting Particles in Aerosol Flow Reactors”

Role: PI  
Funding Agency: National Science Foundation – POWRE Award  
Amount: \$75,000  
Dates: Jul 1999 – Dec 2000

“Engineering Submicron Particles for Advanced Materials Applications”

Role: PI  
Funding Agency: University of Colorado Junior Faculty Development Award  
Amount: \$5,000  
Dates: Jun 1999 – Jun 2000

“On the Behavior of Large-Scale Multiphase Systems”

Role: PI  
Funding Agency: University of Colorado Undergraduate Research Opportunities Program  
Amount: \$2,000  
Dates: Aug 1998 – May 1999

“Predicting Hydrodynamics and Heat Transfer in Dense, Turbulent Gas-Solid Suspensions”

Role: co-PI  
Collaborators: Prof. Jennifer Sinclair (PI)  
Funding Agency: Pittsburgh Supercomputing Center  
Amount: 99 CRAY Y-MP C90 service units  
Dates: Mar 1995 – Mar 1996

“Predicting the Turbulent Pneumatic Transport of Particulate Solids”

Role: co-PI  
Collaborators: Prof. Jennifer Sinclair (PI)  
Funding Agency: Pittsburgh Supercomputing Center  
Amount: 90 CRAY Y-MP C90 service units  
Dates: Feb 1994 – Feb 1995

**COURSES TAUGHT** ( \* converted from a 4.0 scale to 6.0 scale for consistency)

Applied Data Analysis, CHEN 3010 (undergraduate course)

Fall 2010                      111 students                      Instructor Rating – 4.4 / 6.0

Chemical Engineering Fluid Mechanics, CHEN 3200 (undergraduate course)

Spring 2010                      97 students                      Instructor Rating – 5.3 / 6.0



Spring 2008	54 students	Instructor Rating – 5.8 / 6.0
Spring 2005	57 students	Instructor Rating – 5.0 / 6.0*
Spring 2004	55 students	Instructor Rating – 3.3 / 6.0*
Spring 2002	51 students	Instructor Rating – 5.4 / 6.0*

Instrumentation and Process Control, CHEN 4570 (undergraduate course with laboratory section)

Spring 2007	46 students	Instructor Rating – 5.7 / 6.0
Spring 2003	35 students	Instructor Rating – 4.5 / 6.0*
Spring 2000	54 students	Instructor Rating – 4.0 / 6.0*
Spring 1999	44 students	Instructor Rating – 5.6 / 6.0*

Particle Technology, CHEN 4650/5650 (combined undergraduate/graduate course)

Spring 2011	27 students	pending
Fall 2008	41 students	Instructor Rating – 4.8 / 6.0
Fall 2006	25 students	Instructor Rating – 4.7 / 6.0
Fall 2004	22 students	Instructor Rating – 5.4 / 6.0*
Fall 2002	22 students	Instructor Rating – 4.8 / 6.0*

Mathematical Methods in Chemical Engineering, CHEN 5740 (graduate course)

Fall 2009	47 students	Instructor Rating – 5.4 / 6.0
Fall 2003	33 students	Instructor Rating – 4.6 / 6.0*
Spring 2001	12 students	Instructor Rating – 5.2 / 6.0*
Fall 1999	19 students	Instructor Rating – 5.4 / 6.0*
Fall 1998	14 students	Instructor Rating – 4.8 / 6.0*

### UNDERGRADUATE RESEARCHERS SUPERVISED

- 1) John Zenk (Jan 11 – present)
- 2) Will Brewer (May 10 – present): Best Poster Award, 2010 NSF REU Site Program
- 3) Drew Parker (May 10 – Dec 10)
- 4) Daniel Cromer (Jan 08 – May 10)
- 5) Jeff Wolz (May 08 – Oct 09)
- 6) Michael Pacella (Jun 09 – Aug 09)
- 7) Zach Greene (May 09 – Aug 09)
- 8) Katherine Potter (Jan 08 – May 09)
- 9) Alexandra Pavlovna Zelinskaya (Aug 07 – Mar 08)
- 10) Kenshiro Nakagawa (May 07 – May 08)
- 11) Jonathan Tebbe (Jun 07 – Aug 07)
- 12) Joe Kozlowski (Aug 06 – Aug 07)
- 13) Dorota Gawel (Aug 06 – Dec 06)
- 14) Elsa Birch (Aug 06 – Dec 06)
- 15) Andrea Stevens (Jan 06 – Aug 06)
- 16) Heather Woods (Aug 05 – Jan 06)
- 17) Matt Lehr (Jun 05 – Aug 05)
- 18) John Bedenbaugh (Jun 05 – Aug 05)
- 19) Joseph Duncan (Jun 04 – Aug 04)
- 20) Drew Stevens (Jul 03 – Dec 03 and May 04 – Aug 04)
- 21) Laura Crawford (Jun 03 – Aug 03)
- 22) Houston Frost (May 02 – Sep 02)
- 23) Samaria Moore (Jun 02 – Aug 02)
- 24) Melinda Roskos (Aug 00 – May 01)
- 25) Matthew Condiotti (May 00 – May 01)

- 26) David Michaels (Jan 00 – May 01)
- 27) Michael Swanson (May 99 – Aug 00)
- 28) Manuel Najjar (May 99 – Aug 99)
- 29) Kim Frender (Sep 98 – May 99)
- 30) Michael Detamore (Sep 98 – Aug 99)

#### **GRADUATE (PhD) STUDENTS SUPERVISED**

- 1) Kyle Berger (Ph.D. candidate in Chemical Engineering)
- 2) Jennie Jorgenson (Ph.D. candidate in Chemical Engineering; co-advised with Professor Robert H. Davis)
- 3) Peter Mitrano (Ph.D. candidate in Chemical Engineering)
- 4) Aaron Murray (Ph.D. candidate in Chemical Engineering)
- 5) Jia-Wei Chew (Ph.D. candidate in Chemical Engineering)
- 6) Carly Donahue (Ph.D. candidate in Physics)
- 7) Brent Rice, Ph.D., Chemical Engineering (July 2009)  
*Dissertation Title:* Clustering Instability in Polydisperse, Rapid Granular Flows  
*Employment:* CaridianBCT (Lakewood, CO)
- 8) José Leboreiro, Ph.D. Chemical Engineering (Dec 2007)  
*Dissertation Title:* Influence of Drag Laws on Segregation and Bubbling Behavior in Gas-fluidized Beds  
*Awards:* Department of Chemical and Biological Engineering Graduate Student Annual Research Symposium (2<sup>nd</sup> place)  
Department of Chemical and Biological Engineering Outstanding Graduate Teaching Assistant Award (2006)  
*Employment:* Archer Daniels Midland (Decatur, IL)
- 9) Janine Galvin, Ph.D. Chemical Engineering (Aug 2007; co-advised with Professor Robert H. Davis)  
*Dissertation Title:* On the Hydrodynamic Description of Binary Mixtures of Rapid Granular Flows and Gas-fluidized Beds  
*Employment:* Department of Energy, Albany Research Center (Albany, OR)  
*Awards:* 2008 AIChE Particle Technology Forum Award for Best Ph.D. in Particle Technology  
NSF Graduate Fellowship Honorable Mention
- 10) Advait Kantak, Ph.D. Chemical Engineering (Dec 2005; co-advised by Professor Robert H. Davis)  
*Dissertation Title:* Wet Particle Collisions  
*Employment:* Intel Systems (Portland, OR)
- 11) Jennifer Walsh, Ph.D. Chemical Engineering (Jun 2005; co-advised by Professor Alan Weimer)  
*Dissertation Title:* Thermophoretic Deposition of Aerosol Particles in Laminar Tube Flow with Mixed Convection  
*Employment:* Composite Technology Development, Inc. (Lafayette, CO)

- 12) Casey Carney, Ph.D. Chemical Engineering (Jun 2005; co-advised by Professor Alan Weimer)  
*Dissertation Title:* Rapid Decomposition of Nickel Oxalate Powders  
*Employment:* Department of Energy, Albany Research Center (Albany, OR)
- 13) Michael Weber, Ph.D. Chemical Engineering (Sep 2004)  
*Dissertation Title:* Simulation of Granular and Gas-Solid Fluidized Systems with Cohesive Particles  
*Employment:* ExxonMobil (Houston, TX)  
*Awards:* Department of Chemical and Biological Engineering Graduate Student Annual Research Symposium (1<sup>st</sup> place)  
Department of Chemical and Biological Engineering Outstanding Graduate Teaching Assistant Award
- 14) Steven Dahl, Ph.D. Chemical Engineering (Aug 2004)  
*Dissertation Title:* Investigation of the Fundamental Behavior of Particulate Flows with Continuous Size Distributions  
*Employment:* British Petroleum (Houston, TX)  
*Awards:* NSF Graduate Fellowship  
2004 Max S. Peters Outstanding Graduate Student, Department of Chemical and Biological Engineering, University of Colorado

#### **POSTDOCTORAL RESEARCHERS SUPERVISED**

- 1) Dr. Anshu Anand (Oct 09 – present), Postdoctoral Researcher
- 2) Dr. Steven Dahl (Feb 10 – Apr 11), Senior Research Associate  
*Employment:* British Petroleum (Houston, TX)
- 3) Dr. Harish Viswanathan (Aug 07 – Oct 08), Postdoctoral Researcher  
*Employment:* Comsol Multiphysics (India)
- 4) Dr. Gustavo Joseph (Aug 04 – Aug 07), Postdoctoral Researcher  
*Employment:* Tessera (San Jose, CA)
- 5) Dr. Meheboob Alam (Sep 99 – Jun 00), Postdoctoral Researcher  
*Employment:* Associate Professor, Jawaharlal Nehru Center for Advanced Scientific Research (India)

#### **PUBLISHED BOOK REVIEWS**

C. M. Hrenya, “Computational Granular Dynamics – Models and Algorithms, Thorsten Poschel and Thomas Schwager,” *Granular Matter*, **8**, 55 (2006).

#### **CONSULTING WORK**

Consulting for a global natural resources company (2007)  
Consulting for a global materials manufacturing company (2011)

#### **INVITED WORKSHOPS**

Workshop on Multiphase Flow Research, National Energy Technology Laboratory, Morgantown, WV (June 2006)

Kavli Institute for Theoretical Physics – Granular Physics, University of California at Santa Barbara (May-June 2005)

CECAM Workshop – Experimentalist-Modeling Interactions: New Trends on Modeling Granular Flows, Lyon, France (June 2004)

NASA Office of Biological and Physical Research – Workshop on Fine Particulates, NASA Glenn Research Center (May 2003)

DOE GLUE Workshop on Granular Flows, Argonne National Laboratory, Chicago, IL (Mar 2002)

NSF New Century Scholars Workshop, Stanford University, Stanford, CA (Aug 1999)

### **CONFERENCE ORGANIZING COMMITTEES**

Organizing Committee – 2011 Institute of Mathematics and its Applications: Second Workshop on Dense Granular Flows (Cambridge, UK)

Organizing Committee – 2011 International Conference on Fluidized Bed Technology - CFB-10 (Bend, OR)

Organizing Committee – 2009 Powders and Grains (Golden, CO)

Organizing Committee – 2008 Institute of Mathematics and its Applications: Workshop on Dense Granular Flows (Cambridge, UK)

Chair (elected) – 2006 Gordon Research Conference on Granular and Granular-Fluid Flows (Oxford, UK)

Social Functions Director – 2006 World Congress of Particle Technology V (Orlando, FL)

Vice Chair (elected) – 2004 Gordon Research Conference on Granular and Granular-Fluid Flows (Colby College, ME)

### **TECHNICAL COMMITTEES**

Newsletter Editor – AIChE Particle Technology Forum (PTF) (Aug 2002 – present)  
AIChE Marx Isaacs Newsletter Award (2003)

Member, Executive Committee (elected) – AIChE Particle Technology Forum (PTF) (Nov 2004 – Nov 2008 and Nov 2010 – Nov 2014)

### **TECHNICAL SESSIONS CHAIRED OR CO-CHAIR**

“Continuum Modeling,” Powders & Grains 2009, Golden, CO (Jul 2009)

“Advances in Simulation Techniques,” International Congress of Rheology, Monterey, CA (Aug 2008)

Granular Flows: A Proving Ground for Nonequilibrium Statistical Mechanics, Sevilla, Spain (Sep 2007)

“Education in Particle Technology,” Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA (Nov 2003)

“Tutorial on Processing, Handling, and Characterization of Powder Agglomerates,” Annual Meeting of the American Institute of Chemical Engineers, Indianapolis, IN (Nov 2002)

“Fluidization and Fluid-Particle Systems,” World Congress of Particle Technology 4, Sydney, (Jul 2002)

“Scale-up and Model Development for Fluid-Particle Systems,” Annual Meeting of the American Institute of Chemical Engineers, Reno, NV (Nov 2001)

“Scale-up and Model Development for Fluid-Particle Systems,” Annual Meeting of the American Institute of Chemical Engineers, Los Angeles, CA (Nov 2000)

“Gas-Solid Flows,” United Engineering Foundation Conference on Chemical Reaction Engineering VII: Computational Fluid Dynamics, Quebec City, Canada, (Aug 2000).

“Scale-up and Model Development for Fluid-Particle Systems,” Annual Meeting of the American Institute of Chemical Engineers, Dallas, TX (Nov 1999)

“Fundamentals of Fluidization and Fluid-Particle Systems – Poster Session,” Annual Meeting of the American Institute of Chemical Engineers, Dallas, TX (Nov 1999)

## **JOURNAL REVIEWS**

AIChE Journal  
Chemical Engineering Communications  
Chemical Engineering Research and Design  
Chemical Engineering Science  
Computers and Chemical Engineering  
Europhysics Letters  
Industrial and Engineering Chemistry Research  
International Journal of Multiphase Flows  
Journal of Engineering Education  
Journal of Fluids Engineering  
Journal of Fluid Mechanics  
Molecular Simulation  
New Journal of Physics  
Particulate Science and Technology  
Physical Review E  
Physical Review Letters  
Physics of Fluids  
Powder Technology

## **JOURNAL EDITORIAL BOARDS**

Editor, *Granular Matter* (Jun 2008 – present)

## **JOURNAL EDITORIAL DUTIES**

Guest co-editor (with Prof. Scott Fogler) for special feature in *Chemical Engineering Education* on a workshop on the Next Millennium in Chemical Engineering (Spring 2006).  
Guest co-editor (with Prof. Alan Weimer as Guest Editor) of special issue of *Powder Technology* on Engineered Particle Processing, **156**, 61 (2005).

## **CONFERENCE PROCEEDINGS REVIEWS**

Powders and Grains 2009 (Golden, Jul 2009)  
Materials Research Society – Symposium on Granular Materials (Boston, Dec 2002)  
World Congress on Particle Technology 4 (Sydney, Jul 2002)

## **PROPOSAL REVIEWS**

American Chemical Society – Petroleum Research Fund (2000 - present)  
Department of Energy – University Coal Research Program (2008 – present)  
National Science Foundation – Reviewer for Unsolicited Grants in CBET division (2007 - present)  
National Science Foundation – Reviewer for Unsolicited Grants in CTS division (2001 – 2006)  
National Science Foundation – Reviewer for Unsolicited Grants in CHE division (2003 – present)  
National Science Foundation – Review Panel Member for IGERT program (2006)  
National Science Foundation – Review Panel Member for MRI program (2002)

National Science Foundation – Review Panel Member for Particle Science and Technology ERC  
(2001, 2002)

### **BOOK REVIEWS**

Fluid Mechanics for Chemical Engineers (3<sup>rd</sup> edition) by Noel de Nevers (2003)

### **DEPARTMENT SERVICE**

Member, Promotion and Tenure Committee for Tenure Case (Fall 2010)  
Coordinator, Research Methods and Ethics Course (Aug 2007 – Dec 2007)  
Chair, Faculty Search Committee (Aug 2007 – May 2008)  
Member, Department Chair Search Committee (Jun 2006 – Mar 2007)  
Chair, International Recruiting (Aug 2006 – May 2007)  
Member, Graduate Program Committee (Aug 2002 – Aug 2004, Aug 2006 – present)  
Undergraduate Advisor (Aug 1998 – Aug 2000, Fall 2006, Fall 2007 – present)  
Member, PhD Preliminary Examination Panel (Aug 2003 – present)  
Chair, Centennial Celebration Committee (Aug 2003 – May 2005)  
Chair, PhD Preliminary Examination Committee (Aug 2003 – Aug 2004)  
Member, Development Committee (Aug 2003 – Aug 2004)  
Member, Faculty Search Committee (Sep 2002 – May 2003)  
Director, Graduate Program (Aug 2001 – Aug 2002, Aug 2009 – present)  
Coordinator, Seminar Series (Aug 2000 – Jul 2001)  
Faculty Advisor, Omega Chi Epsilon (Jan 2000 – Jul 2001)  
Coordinator, Senior Thesis Course (Aug 1999 – May 2002)  
Freshman Orientation (Fall 1998)  
Co-Instructor, Senior Seminar Course (Fall 1998 - 2000)  
Member, M.S. and Ph.D. Thesis Committees (Oct 98 – present)

### **COLLEGE SERVICE**

Faculty Leadership Advancement Group (Aug 2006 – May 2009)  
Instructor for High School Honors Institute (Aug 2001)  
Instructor for ITLL K-12 Teacher Workshops (Jul 2000)  
Instructor in Success Institute for Underrepresented Pre-college Students (Jun 2000)  
Departmental Representative at Undergraduate Research Opportunities Fair (Sep 1999)  
Member of Faculty Panel for Engineering Open House (Oct 1998)

### **UNIVERSITY SERVICE**

Member, Standing Committee on Research Misconduct (Oct 2008 – present)  
Member, Provost Faculty Awards Committee (2009)  
Reviewer of Undergraduate Research Opportunities Program (UROP) Proposals (Fall 2000, Fall 2001, Spring 2002)  
Reviewer for Beverly Sears Dean's Small Grants (Spring 1999 and Spring 2000)

### **PROFESSIONAL AFFILIATIONS**

American Chemical Society (ACS)  
American Institute of Chemical Engineers (AIChE)  
American Physical Society (APS)  
American Society of Engineering Education (ASEE)