Peter P. Mitrano

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EDUCATION

Ph.D. in Chemical & Biological Engineering
University of Colorado, Boulder, 2014
Thesis: Particle flow instabilities
Advisor: Prof. Christine Hrenya

B.S. in Chemical Engineering
University of New Hampshire, Durham, 2009

AWARDS AND HONORS

- May 2014 Max S. Peters Outstanding Graduate Award for graduate research
- Mar. 2014 "Focus on Fluids" publication highlight in *Journal of Fluid Mechanics Rapids*
- May 2013 Invited keynote at Fluidization XIV: From Fundamentals to Products (Noordwijkerhout, the Netherlands)
- Oct. 2012 Invited lecture (Universidad de Extremadura, Spain)

TEACHING ACTIVITIES

Instructor, University of Colorado, Grand Junction, CO (Fall 2016 to present)
Colorado Mesa University/ University of Colorado Boulder Partnership Program
Department of Mechanical Engineering

Lecturer, University of Colorado, Boulder, CO (Spring 2016)
Computational Methods (MCEN 3030)

Lecturer, University of Colorado, Boulder, CO (Spring, Summer, Fall 2015, Summer 2016)
Fluid Mechanics (CHEN 3200, MCEN 3021)

Lecturer, University of Colorado, Boulder, CO (Summer 2015)
Heat Transfer (CHEN 3210)

Lecturer, University of Colorado, Boulder, CO (Fall 2014, Fall 2015)
First-Year Engineering Projects (GEEN 1400)

Advanced Teaching Assistant, University of Colorado, Boulder, CO (Spring 2013)
Fluid Mechanics (CHEN 3200, Prof. Christine Hrenya)

Teaching Assistant, University of Colorado, Boulder, CO (Fall 2009)
Introduction to Engineering Computing (GEEN 1300, Prof. David Clough)

LEADERSHIP ACTIVITIES

Faculty mentor to first-year engineering project teams:

Laminar Flow Reversibility, University of Colorado (Fall 2018)

- Won student Expo
- Met with team of four every other week
- Study of the physics of laminar fluid flows
- Team built concentric-cylinder housing for glycerin
- Analyzed effect of system length scales on Reynolds number to ensure laminar flow
- Recovered unmixed dye injections after rotating cylinder and apparently mixing dyes

Terminal Velocity of Sphere, University of Colorado (Spring 2018)

- Won student Expo
- Met with team of four every other week
- Study of terminal velocity of metal spheres in glycerin
- Team programmed Arduino-controlled, motorized magnet to drop and recover sphere
- Analytical analysis included hindered-settling velocity correction

Fluid Velocity Prediction in Presence of Viscous Losses, University of Colorado (Spring 2018)

- Met with team of four every other week
- Team built draining-tank system to maintain a constant static-pressure head
- Study of the mechanical-energy balance to describe a flowing fluid
- Analytical analysis included fixed-point iteration to predict exit velocity
- Calculated pipe length required to obtain laminar, transitional, and turbulent flow

Direct supervisor to undergraduate researchers at the University of Colorado:

John R. Zenk, University of Colorado (Jan 2011 – May 2012)

- Outcome: 2 publications, 7 conference presentations, 1 senior thesis

Christopher J. Ewasko, University of Colorado (Aug 2011 – May 2012)

- Outcome: 2 publications, 3 conference presentations

Andrew M. Hilger, Harvey Mudd College (Jun 2011 – Aug 2011)

- Outcome: 2 publications, 2 conference presentations

Daniel J. Cromer, University of Colorado (Dec 2009 – May 2010)

- Outcome: 1 publication, 2 conference presentations

COURSES TAUGHT

Course	Times taught
MCEN 3021: Fluid Mechanics (or CHEN 3200)	12x
MCEN 3022: Heat Transfer (or CHEN 3210)	4x
MCEN 3047: Data Analysis and Experimental Methods	3x
ENGR 343: Dynamics	2x
GEEN 1400: First-Year Engineering Projects	2x
MCEN 4117: Anatomy and Physiology for Engineers	2x
MCEN 3030: Computational Methods (lab only)	2x
MCEN 3030: Computational Methods	1x
MCEN 3012: Thermodynamics	1x
MCEN 4037: Measurements Lab	1x
CHEN 2120: Material & Energy Balances	1x

RESEARCH EXPERIENCE

Postdoctoral Researcher, Sept. 2014 – Dec. 2014
University of Colorado, Boulder, CO

- Studied instabilities in a frictional, granular mixture
- Assessed recent continuous-solids-phase theories for two-phase flows

Ph.D. Candidate, Dec, 2009 – Aug, 2014
University of Colorado, Boulder, CO

- Created molecular dynamics (MD) code for granular flow
- Studied importance of various driving mechanisms for instability in particulate flows

Visiting Researcher, September – November 2012
Universidad de Extremadura, Badajoz, Spain

- Verified polydisperse continuum theory in binary limit via MD simulations
- Tested gas-solid continuum theory against MD-direct numerical simulation

Fermentation Internship, June – August 2008 and 2009
GlycoFi Research Laboratory (Merck & Co.), Lebanon, NH

- Tested differences in gene regulation for healthy/ lysis-prone cells (led to patent)
- Evaluated new pharmakinetic model against current software

Biomedical Engineering Laboratory- Project Leader, January – May 2008
University of New Hampshire, Durham, NH

- Improved accuracy in the measurements of flow separation surface

Interfacial Phenomena Laboratory- Project Assistant, October – December 2007
University of New Hampshire, Durham, NH

- Fabricated microfluidic-using devices via soft lithography

COLLABORATIVE ACTIVITIES

Department of Energy, National Energy Technology Laboratory, Morgantown, West Virginia
Dr. Sofiane Benyahia (May 2010 – Dec. 2014) Dr. Janine E. (Galvin) Carney (Aug 2012 – Dec. 2014)

- Outcome: 1 publication, 5 conference presentations

Colorado School of Mines, Golden, CO
Prof. Xiaolong Yin (Jun 2011 – Dec. 2014)

- Outcome: 1 publication, 2 conference presentations

Universidad de Extremadura, Badajoz, Spain
Prof. Vicente Garzó (Jan 2011– Dec. 2014)

- Outcome: 2 publications, 2 conference presentations

REFEREED JOURNAL PUBLICATIONS (*undergraduate researcher)

1) Mitrano, P. P., J. R. Zenk*, S. Benyahia, J. E. Galvin, S. R. Dahl, C. M. Hrenya. Kinetic-theory-based predictions of clustering instabilities in granular flows: beyond the small-Knudsen regime. *Journal of Fluid Mechanics (Rapids)* **738**, R2 (2014).

2) Mitrano P. P., V. Garzó, C. M. Hrenya. Instabilities in moderately dense granular binary mixtures. *Physical Review E* **89**(2): 020201, Rapid Communication (2014).

3) Yin, X., J. R. Zenk*, P. P. Mitrano, C. M. Hrenya, "Impact of collisional versus viscous dissipation on flow instabilities in gas-solid systems," *Journal of Fluid Mechanics (Rapids)* **727**, R2 (2013).

4) Mitrano, P. P., S. R. Dahl, A. M. Hilger*, C. J. Ewasko*, and C. M. Hrenya, "Dual role of friction in granular flows: attenuation versus enhancement of instabilities," *Journal of Fluid Mechanics* **729**, 484 (2013).

5) Mitrano, P.P., V. Garzó, A. M. Hilger*, C. J. Ewasko*, and C. M. Hrenya, "Assessing a dynamic description for instabilities in highly dissipative, freely cooling granular gases," *Physical Review E* **85**, 041303 (2012).

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* **23**, 093303 (2011).

INVITED LECTURES (speaker underlined)

1) Mitrano, P. P., V. Garzó, A. M. Hilger, C. J. Ewasko, J. R. Zenk, C. M. Hrenya, "Assessing kinetic theory via instabilities in a freely cooling particulate flow," Invited lecture, Dept. of Theoretical Physics, Universidad de Extremadura, Spain (Oct 2012).

CONFERENCE PRESENTATIONS (speaker underlined)

2) Mitrano, P. P., J. R. Zenk, S. Benyahia, J. E. Galvin, and C. M. Hrenya, "Quantifying the Uncertainty of Kinetic Theory Predictions of Clustering," 2014 Crosscutting Research Review Meeting, Pittsburgh, PA (May 2014).

3) Mitrano, P. P., J. R. Zenk, S. Benyahia, J. E. Galvin, V. Garzó, X. Yin, and C. M. Hrenya, "Instabilities in Particle Flows: Assessing Hydrodynamics and Understanding Dominant Mechanisms," University Coal Research Contractors Review Conference, Pittsburgh, PA (June 2013).

4) Yin X., J. R. Zenk, P. P. Mitrano, C. M. Hrenya, "Instabilities in Gas-Solid Systems: Role of Dissipative Collisions Vs. Viscous Losses," Keynote speaker, Fluidization XIV: From Fundamentals to Products, Noordwijkerhout, The Netherlands (May 2013).

5) Mitrano, P. P., J. R. Zenk, C. J. Ewasko, S. Benyahia, and C. M. Hrenya, "Clustering Instabilities in Homogeneously Cooling Particulate Flows," 65th Annual Meeting of American Physical Society Division of Fluid Dynamics, San Diego, CA (Nov 2012).

6) Mitrano, P. P., J. R. Zenk, S. Benyahia, and C. M. Hrenya, "Predicting Clustering Instabilities in Granular Materials: Kinetic-Theory Simulations Vs. Molecular Dynamics Simulations," Annual Meeting of the American Institute of Chemical Engineers, Pittsburgh, PA (Nov 2012).

7) Mitrano, P. P., J. R. Zenk, S. Benyahia, S. R. Dahl and C. M. Hrenya, "Predicting clustering instabilities in granular flows: Hydrodynamics vs. molecular dynamics simulations (poster)," Gordon Research Conference on Granular and Granular-fluid Flows, Davidson, NC (Jul 2012).

8) Mitrano, P. P., J. R. Zenk, S. Benyahia, V. Garzó, C. J. Ewasko, and C. M. Hrenya, "Quantifying the Uncertainty of Kinetic-Theory Predictions of Clustering," 2012 University Coal Research/Historically Black College and Universities and other Minority Institutions Contractors Review Conference, Pittsburgh, PA (May 2012).

9) Mitrano, P.P., A. Hilger and C. M. Hrenya, "Instabilities in a Freely Cooling Granular Gas: A Quantitative Comparison of DEM simulations and Kinetic-Theory-based models," 64th Annual Meeting of American Physical Society Division of Fluid Dynamics, Baltimore, MD (Nov 2011).

10) Mitrano, P.P., S. R. Dahl and C. M. Hrenya, "Impact of Friction On Instabilities In the Homogenous Cooling of Granular Materials," Annual Meeting of the American Institute of Chemical Engineers, Minneapolis, MN (Oct 2011).

11) 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).