

Kimberly M. Hill

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385 Saint Anthony Falls Laboratory
Department of Civil Engineering
University of Minnesota, Minneapolis, Minnesota
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EDUCATION

Doctor of Philosophy in Physics, 1997. University of Minnesota, Minneapolis
Dissertation: Reversible Axial Segregation: Digital Surface Analysis and Magnetic Resonance Imaging
Masters of Science in Physics, 1996. University of Minnesota, Minneapolis
Thesis: Reversible Axial Segregation of Rotated Granular Media
Bachelor of Science in Physics with Distinction, magna cum laude, 1991. University of Michigan, Ann Arbor
Thesis: Coupling of String Harmonics of a Violin

PROFESSIONAL EXPERIENCE

2005-present	<i>Assistant Professor</i> , Department of Civil Engineering, University of Minnesota, Minneapolis, Minnesota.
2004-2005	<i>Assistant Professor</i> , Department of Theoretical and Applied Mechanics, University of Illinois at Urbana-Champaign, Urbana, Illinois.
2001-2004	<i>Lecturer and Visiting Assistant Professor</i> , Department of Theoretical and Applied Mechanics, University of Illinois at Urbana-Champaign, Urbana, Illinois.
1999-2001	<i>Assistant Professor</i> , Department of Physics University of Wisconsin -Whitewater, Whitewater, Wisconsin
1998-1999	<i>Postdoctoral Appointee</i> , Department of Chemical Engineering Northwestern University, Evanston, Illinois
1997-1998	<i>Postdoctoral Appointee</i> , Sandia National Laboratories Sandia National Laboratories, Albuquerque, New Mexico
Summer, 1996	<i>Summer Research Assistant</i> , New Mexico Resonance The Lovelace Institutes, Albuquerque, New Mexico
1992-1997	<i>Graduate Assistant</i> , Department of Physics University of Minnesota, Minneapolis, Minnesota
1991-1992	<i>Research Assistant</i> , High Energy Physics Laboratory, Department of Physics University of Michigan, Ann Arbor, Michigan

AWARDS & HONORS

- *ADVANCE Young Scientist Award*, University of Arizona (2007-2008)
- University of Illinois Outstanding Engineering Advisor Award (2001-2002, 2002-2003, 2004-2005)
- University of Illinois Academy for Excellence in Engineering Education Collins Scholar (2002)
- University of Illinois Outstanding Engineering Advisor Award (2001-2002)
- University of Illinois Research Board Grant (2001)
- University of Wisconsin – Whitewater Faculty Development Grant (2000-2001)
- University of Minnesota Dissertation Fellowship (1996)

PUBLICATIONS IN PEER-REVIEWED JOURNALS

- Hill, K. M. and Yohannes, B. Rheology of Dense Granular Mixtures: Boundary Pressures, Phys. Rev. Lett. (2011, in press).
- Yohannes, B., and Hill, K. M. Rheology of dense granular mixtures: Particle-size distributions, boundary conditions, and collisional time scales, Phys. Rev. E **82**, 061301(2010).
- de Vet, S. J., Yohannes, B., Hill, K. M. and de Bruyn, J. R., John R. Collapse of a rectangular well in a quasi-two-dimensional granular bed Phys. Rev. E **82**, 041304 (2010).
- Hill, K. M., Fan, , Zhang, J., Van Niekerk, C., Zastrow, E., Hagness, S. C. and J.T. Bernhard. Granular Segregation Studies for the Development of a Radar-Based Three-Dimensional Sensing System, *Granular Matter*, doi: 10.1007/s10035-010-0167 (2010).
- Hill, K. M., L. DellAngelo, and M. M. Meerschaert Heavy tailed travel distance in gravel bed transport: An exploratory enquiry, J. Geophys. Res., doi:10.1029/2009JF001276 (2010).
- K. M. Hill, H. Shen (2010) EM08 Mini-symposium on Granular Materials – Editorial, *Granular Matter*, doi: 10.1007/s10035-010-0175.
- Yi Fan and K. M. Hill (2010) Shear-driven segregation of dense granular mixtures in a split-bottom cell Phys. Rev. E **81**, 041303 (2010).
- Hill, K. M. and Fan, Y. Isolating Segregation Mechanisms in a Split-Bottom Cell, *Physical Review Letters* **101**, 088001/1-4. (2008).
- Hill, K. M. and Zhang, J. Kinematics of densely flowing granular mixtures, *Physical Review E* **77**, 061303 (2008).
- Gioia, G., Ott-Monsivais, S., Hill, K. M. Fluctuating velocity and momentum transfer in dense granular flows, *Physical Review Letters* **96**, 138001/1-8 (2006).
- Hill, K. M., Gioia, G., Amaravadi, D., Winter, W. Moon Patterns, Sun Patterns, and Wave Breaking in Rotating Granular Mixtures, *Complexity- cover article* (2005).
- Maneval, J.E., Hill, K. M., Smith, B. E., Caprihan, A., and Fukushima, E. Effects of end wall friction in rotating cylinder granular flow experiments, *Granular Matter* **4**, (2005).
- Hill, K. M., Gioia, G., Amaravadi, D., Radial Segregation Patterns in Rotating Granular Mixtures: Waviness Selection, *Physical Review Letters* **93**, 224301 (2004).
- Hill, K. M. Gioia, G. and Tota V. V. Structure and Kinematics in Dense Free-Surface Granular Flow. *Physical Review Letters* **91**, 064302 (2003).
- Hill, K. M., Jain, Nitin and Ottino, J. M. Modes of granular segregation in a noncircular rotating cylinder. *Physical Review E*, **64**, 011302/1-011302/4 (2001).
- Hill, K. M., Khakhar, D. V., Gilchrist, J. F., McCarthy, J. J. and Ottino, J. M. Segregation-driven organization in chaotic granular flows. *Proceedings of the National Academy of Sciences*, **96**, (21), (cover article) 11701-11706 (1999).
- Hill, K. M., Gilchrist, J. F., Khakhar, D. V., McCarthy, J. J. and Ottino, J. M. Mixing of granular materials: A test-bed dynamical system for pattern formation. *International Journal of Bifurcation and Chaos*, **9**, (cover article) 1467-1484 (1999).
- Martin, J. E., Hill, K. M. and Tigges, C. P. Magnetic-field-induced optical transmittance in colloidal suspensions. *Physical Review E*, **59**, 5675-5692 (1999).
- Hill, K. M., Caprihan, A., Kakalios, J. Axial segregation of granular media segregated in a rotating drum mixer: Pattern Evolution. *Physical Review E*, **56**, 4386-4393 (1997).
- Hill, K. M., Caprihan, A., Kakalios, J. Bulk segregation of granular media segregated in a rotating drum measured by Magnetic Resonance Imaging. *Physical Review Letters*, **78**, 50-53 (1997).
- Hill, K. M. and Kakalios, J. Reversible axial segregation of rotating granular media. *Physical Review E* **52**, 4, pt.. B, pp. 4393-400 (1995).
- Hill, K. M. and Kakalios, J. Reversible axial segregation of binary mixtures of granular materials. *Physical Review E* **49**, 5, pt. A, pp. R3610-13 (1994).
- Luppov, W. A., Kaufman, W. A., Hill, K. M., Raymond, R. S. and Krisch, A. D. Focusing a beam of ultracold spin-polarized hydrogen atoms with a helium-film-coated quasiparabolic mirror. *Physical Review Letters* **71**, 15, 2405-2408 (1993).

ARTICLES IN CONFERENCE PROCEEDINGS

- Yohannes, B. and Hill, K. M. Preliminary investigations on the rheology and boundary stresses associated with granular mixtures” AIP Conference Proceedings (edited by J. D Goddard) Joint IUTAM-ISIMM Symposium on Mathematical Modeling and Physical Instances of Granular Flows Reggio Calabria, Italy, 14-18 September 2009. (published, 2010).
- Hill, K. M., Fan, Y. Zhang, J., Bernhard, J. T., Hagness, S. C. Granular Segregation Studies for Retroreflector Sensor Development SPIE March 2008 Meeting of Smart Structures/Nondestructive Evaluation for Health Monitoring and Diagnostics, San Diego, 2008.
- G. Parker, V. Voller, C. Paola, K. Hill, L. S. Sklar, W. E. Dietrich, Comminution As A Mechanism For Downstream Fining In Rivers: Formulation, Riverflow Conference, 2008.
- Hill, K.M. Yohannes, B. Khazanovich, L., Toward a Unified Mechanistic Approach for Modeling Tests of Unbound Pavement Materials, Transportation Research Board Meeting, 2008.
- Hill, K. M., Gilchrist, J. F., Khakhar, D.V. and Ottino, J. M. Signatures of Chaos in 2d Tumbling Mixers. Interplay between Chaos, Segregation, and Mixing *Proceedings for the Granular Flow Focus Meeting of the International Union of Theoretical and Applied Mechanics*, June, Kluwer Academic Publishers, Netherlands p. 171 (2000).
- Hill, K. M., Martin, J. E. and Adolf, D. A. Rheology of Colloidal Aggregates. *Fractal Aspects of Materials*, edited by Fereydoon Family, *MRS Symposia Proceedings* (Materials Research Society) (1998).
- Hill, K. M., Kakalios, J., Yamane, K., Tsuji, Y. and Caprihan, A. Dynamic Angle of Repose as a Function of Mixture Concentration: Results from MRI Experiments and DEM Simulations. *Powders and Grains '97*, edited by R. Behringer and J. Jenkins, (Balkema/Rotterdam, Brookfield) p. 483 (1997).
- Hill, K. M., Kakalios, J. and Caprihan, A. Pattern evolution of granular media rotated in a drum mixer. *Materials Research Society Proceeding* (Materials Research Society, Pittsburgh, PA) *MRS vol. 463*, p. 227 (1997).
- Hill, K.M., Caprihan, A. and Kakalios, J. Magnetic resonance imaging of granular media segregated in a rotating drum. *AIChE Conference Proceedings*, July (1996).
- Hill, K. M., Yarusso L., and Kakalios, J. Reversible axial segregation in rotating granular media. *Fractal Aspects of Materials*, edited by Fereydoon Family, Paul Meakin, Bernard Sapoval, and Richard Wool. *MRS Symposia Proceedings No. 367* (Materials Research Society, Pittsburgh), p. 509 (1995).
- Luppov, V. G., Kaufman .W. A., Hill, K. M., Raymond, R. S., and Krisch A. D. A helium film coated quasi-parabolic mirror to focus a beam of ultra-cold spin polarized atomic hydrogen. *AIP Conference Proceedings*, no.293, p. 40-3 (1993).

SELECTED TECHNICAL REPORTS

- Ly, M. E., Zhang, J., and Hill, K.M. Interstitial Fluid Effects on Dense Free-Surface Granular Flow, TAM Report for the NSF REU program on Mechanics of Complex Materials, p. 27 (2005).
- McGough, S. A., Zhang, J., and Hill, K.M. 2D to 3D Transitions in Dense Free-Surface Granular Flow (2005).
- Dienberg, C. and Hill, K. M., Effects of an Underbody Diffuser on Automobile Lift and Drag Characteristics, TAM Report for the Fifth Annual Undergraduate Conference in Mechanics, p. 3 (2004).
- Ott-Monsivais, S, Hill, K. M., Gioia, G, Structure and Velocity Fluctuations in Dense Free Surface Granular Flow, TAM Report for the Fifth Annual Undergraduate Conference in Mechanics, p. 13 (2004).
- Winter, C, Hill, K. M., Gioia, G., The Characteristics and Evolution of Striped Patterns in Rotated Granular Mixtures, TAM Report for the Fifth Annual Undergraduate Conference in Mechanics, p. 35 (2004).
- Hill, K. M., Martin, J. E. and Adolf, D. A. Rheology of colloidal aggregates. Internal report, Sandia National Laboratory (2000)

INVITED TALKS

- Rheology and Segregation in Dense Granular Mixtures*, Department of Aerospace and Mechanics, University of Minnesota, Minneapolis, MN (February, 2010).
- Dense sheared granular flows: segregation, boundary stresses, and erosion*, Department of Geology and Geophysics, University of Minnesota, Minneapolis, MN (December, 2009).
- Probability of travel distances for gravel in bedload transport: size dependence*, Stochastic Transport and Emergent Scaling in Earth-surface Processes (STRESS) workshop, sponsored by National Center for Earth-surface Dynamics (NCED), University of Illinois, Hydrologic Synthesis Activities, and Desert Research Institute, Incline Village, Nevada, (November, 2009).
- Rheology of Dense Sheared Granular Mixtures*, Joint IUTAM-ISIMM Symposium on Mathematical Modeling and Physical Instances of Granular Flows Reggio Calabria, Italy, (September 2009).
- Rheology of sheared granular mixtures*, Warren Lecture, Department of Civil Engineering, University of Minnesota, Minneapolis, MN (September, 2009).
- Disparate segregation mechanisms in dense sheared granular flows*, Institute of Mathematics and its Applications (IMA), Conference on Dense Granular Flows, Isaac Newton Institute of Applied Mathematics, Cambridge, England (January, 2009)
- Size Segregation in Dense Particulate Flows*, American Geophysical Union, San Francisco, CA (December, 2008)
- Predicting order from disorder in dense granular flow*, Department of Aerospace and Mechanics, University of Minnesota, Minneapolis, MN (November, 2008)
- Segregation in dense sheared granular mixtures*, Short talk at the Gordon Conference for Granular and Granular-Fluid Flows, Colby College, Maine (June, 2008)
- Measurements of Sheared Granular Mixtures*, 8th International Workshop in Bifurcations and Degradations in Geomaterials, Lake Louise, Canada (May, 2008)
- Sorting out Segregation Mechanisms at the Interface between Densely Creeping and Energetic Granular Flows*, International Conference of the Engineering Mechanics Institute (EM08), Minneapolis, MN (May, 2008)
- Granular materials mixing: an “open” question*, Department of Physics, University of Western Ontario, London, Ontario (February, 2008)
- Bedload transport: a series of size-dependent stochastic processes*, Stochastic Transport and Emergent Scaling in Earth-Surface Processes, Lake Tahoe, NV (November, 2007)
- Pattern Formation in Laboratory Experiments and Natural Environments*, Department of Civil Engineering, University of Arizona (October, 2007)
- Mixing Mechanisms in Multiphase Flows, Mineral Physics Seminar, Department of Geophysics, University of Minnesota (April, 2006)
- Models for Mixing and Unmixing Granular Flows: Diffusional Mixing, Granular Segregation, and Chaotic Advection, Microscale Flow and Transport Seminar, Department of Chemical Engineering and Material Sciences, University of Minnesota (March, 2006)
- Granular Materials Mixing: Chaotic Advection and Diffusional Mixing, Condensed Matter Seminar, Department of Physics, University of Minnesota (February, 2006).
- Mixing and Segregation Mechanisms in Granular Materials, Civil Engineering, University College Dublin (January, 2006)
- Granular Materials Segregation and Mixing in Rotating Drums with applications to Riverbeds, St. Anthony Falls Laboratory, University of Minnesota (December, 2006)
- Particle Sorting, From Rotating Drums to Riverbeds, Water Resource Science Program Seminar, University of Minnesota (October, 2006)
- An Update on the Granular Flow, Mixing and Segregation, New Mexico Resonance, Albuquerque, New Mexico (August, 2005).
- The Art of Mixing: Chaotic Advection, Resonances, and Pattern Formation, Meeting on Understanding Complex Systems, Department of Physics, University of Illinois (May, 2005).

Kinematics and Pattern Formation in Dense Granular Flow, Department of Civil Engineering, University of Minnesota (April, 2005)

The Emergence of Order and Symmetry in Mixing Devices. Physics Colloquium, Department of Physics, University of Illinois (February, 2005)

How Rocks Roll. Wine Seminar. Department of Physical Geology. University of Oslo, Norway (November, 2004)

Structure, kinematics, and pattern formation in dense granular flow in a drum. Department of Physics. University of Rennes, France (November, 2004)

Structure and flow in granular mixtures. New Mexico Resonance, Albuquerque, New Mexico (July, 2004)

Viscous fingering in granular mixtures. Gordan Conference on Granular Flows, Maine (June, 2004)

Structure and kinematics in granular flow. Special Seminar, Department of Theoretical and Applied Mechanics, University of Illinois (May, 2004)

Interplay between structure and flow in dense granular materials, Department of Physics, University of Illinois (February, 2004).

Structure and kinematics in dense free-surface granular flow, at a Newton Institute Workshop on Flow Regimes, Transitions and Segregation in Granular and Particle-laden Flows, Cambridge, England (2003).

Undergraduate Research: The Perspective of a True Believer. Engineering Council's Undergraduate Research Workshop, Engineering Council, University of Illinois (2003).

Laminarity in Free Surface Boundary Layer Granular Flow, TAM Fluid Seminar (2002)

The competing effects of segregation and chaotic mixing in granular materials. Kimberly Clark Corporation, Neenhan, WI (2000).

Chaos: From sand piles to solar system: Unexpected order in disorder. University of Wisconsin (1999).

Interaction between segregation, chaos, and mixing in granular materials. Northwestern University (1999).

Magnetic Resonance Imaging (MRI) and Fourier analysis of axially segregated granular. James Frank Institute, University of Chicago (1996).

Segregation of sand when rotated in a drum "mixer". St. Olaf College, Minnesota, (1996).

Phase transitions in rotating granular media. Chemical Engineering Department, University of Minnesota (1996).

RECENT CONFERENCE PRESENTATIONS

Hill, K. M., Yohannes, B., (2009). Boundary stresses due to granular mixtures. *American Physical Society, Division of Fluid Dynamics*, Minneapolis, MN

Yohannes, B., Hill, K.M., (2009). Rheology of granular mixtures. *American Physical Society, Division of Fluid Dynamics*, Minneapolis, MN

Fan, Yi, Hill, K.M. (2009). Bulk horizontal size segregation in circular and parallel split-bottom cell. *American Physical Society, Division of Fluid Dynamics*, Minneapolis, MN

Sun, Zhen, Fan, Yi, Hill, K.M. (2009) Dynamics of Large Intruder Particles in a Split Bottom Cell. *American Physical Society, Division of Fluid Dynamics*, Minneapolis, MN

Yohannes, B., Hill, K.M., Hsu, L., Dietrich, W. E. (2008) Boundary stresses due to sheared granular mixtures, *American Geophysical Union Fall Meeting* San Francisco, CA

Hill, K. M., Yohannes, B., Zhang, J. (2008) Force distributions in segregating granular mixtures *American Physical Society, Division of Fluid Dynamics* San Antonio, TX

Yohannes, B., Hill, K.M., Hsu, L., Dietrich, W. E. (2008) Boundary stresses due to sheared granular mixtures, *American Physical Society, Division of Fluid Dynamics* San Antonio, TX

Fan, Y., Hill, K.M. (2008) Experimental and computational studies of segregation in a split-bottom cell, *American Physical Society, Division of Fluid Dynamics* San Antonio, TX

Gaffney, J., Hill, K. M., Paola, C. (2008) Stream bed slope response to gravel and sand, *Minnesota Water Resources Conference* St. Paul, MN

- Hill, K.M. Yi Fan, J. Zhang (2008) Sorting out Segregation Mechanisms in Rotating Drums and Split Bottom Drums, (Gordon Conference for Granular and Granular Fluid Flows) Colby College, Maine.
- Hill, K. M., Fan, Y. Zhang, J., Bernhard, J. T., Hagness, S. C. (2008) Granular Segregation Studies for Retroreflector Sensor Development SPIE March 2008 Meeting of Smart Structures/Nondestructive Evaluation for Health Monitoring and Diagnostics, San Diego.
- Hill, K.M., Yohannes, B., Khazanovich, K. A., (2008) Toward a Unified Mechanistic Approach for Modeling Tests of Unbound Pavement Materials, *Transportation Research Board Meeting*, Washington, DC
- Hill, K.M., DellAngelo, L. (2007) Experimental Study of Different-Sized Tracer Particles in a Laboratory Flume, *American Geophysical Union Fall Meeting* San Francisco, CA
- Hill, K.M., Fan, Y., Zhang, J. (2007) Sorting out segregation mechanisms in densely flowing granular mixtures, *American Physical Society, Division of Fluid Dynamics* Salt Lake City, UT
- Fan, Y., Hill, K.M., Entezari, Z. (2007) Segregation in a split-bottom cell *American Physical Society, Division of Fluid Dynamics* Salt Lake City UT.
- Zhang, J. K.M. Hill (2007) Velocity fluctuations in granular mixtures in a rotating drum *American Physical Society, Division of Fluid Dynamics* Salt Lake City UT.
- Hill, K.M., L. DellAngelo, G. Shaffer (2007) Model studies of different sized tracer particles in bedload transport, *European Geophysical Union General Assembly* Vienna, Austria
- Altobelli, S., K.M. Hill, A. Caprihan (2007) Concentration and Velocity Measurements of Both Phases in Liquid-Solid Slurries *American Physical Society March Meeting* Denver, Colorado.
- Hill, K.M., L. DellAngelo (2006) Experimental Study of Different Sized Tracer Particles in a Gravel-Bed Laboratory Flume, *American Geophysical Union Fall Meeting* San Francisco, CA
- Hill, K.M., J. Zhang Density and Size Dependence of Dense Granular Flow, *American Physical Society, Division of Fluid Dynamics* Orlando, Florida.
- Zhang, J. K.M. Hill (2006) Kinematics of granular slurries *American Physical Society, Division of Fluid Dynamics* Orlando, Florida.
- Hill, K.M. J. Zhang, V. Mittal, S. McGough (2006) Packing and Jamming in Thin Drums Third *Gordon Conference on Granular and Granular-Fluid Flows*, Oxford, England
- Hill, K.M. S. McGough, J. Zhang (2005) Granular Flow in Narrow Channels, *American Physical Society, Division of Fluid Dynamics* Chicago, Illinois.
- Zhang, J. K.M. Hill (2005) Dense Free Surface Flow in Granular Mixtures, *American Physical Society, Division of Fluid Dynamics* Chicago, Illinois.
- Mittal, V. Z. Huang, J. Zhang, K.M. Hill (2005) Radial Striping in Granular Mixtures: a Positive Feedback Mechanism, *American Physical Society, Division of Fluid Dynamics* Chicago, Illinois.
- Hill, K.M. J. Zhang (2004) Boundary layer granular flow: binary mixtures, *American Physical Society, Division of Fluid Dynamics* Seattle, Washington.
- Ott-Monsivais, S. G. Gioia, K.M. Hill (2004) Velocity fluctuations and energy dissipation in granular flow, *American Physical Society, Division of Fluid Dynamics* Seattle, Washington.
- Gioia G. C. Winter, K.M. Hill, (2003) Wavy radial segregation patterns in a rotating drum, *American Physical Society, Division of Fluid Dynamics* New Jersey.
- Hill, K.M. G. Gioia (2003) Self-Diffusion in Dense Granular Flow, *American Physical Society, Division of Fluid Dynamics* Newark, New Jersey.
- Ott-Monsivais, S. G. Gioia, K.M. Hill (2003) Velocity Fluctuation Correlations in Laminar Boundary Layer Granular Flow, *American Physical Society, Division of Fluid Dynamics* Newark, New Jersey.
- Hill, K.M. G. Gioia, S. Ott-Monsivais, V. Tota (2003) Structure and Kinematics in Laminar Boundary Layer Granular Flow, *Society of Engineering Science* Ann Arbor, MI.
- Hill, K.M. G. Gioia, D. Amaravadi (2003) Wavy radial segregation patterns in a rotating drum, *American Physical Society, Division of Fluid Dynamics* Austin, Texas.
- Hill K.M. (2002) Granular segregation in unsteady dense sheared flows, *March Meeting of the American Physical Society*, Indianapolis, Indiana.

Jain, N. A. Akoner, K.M. Hill, J.M. Ottino, R.M. Lueptow (2000) Particle tracking techniques for measuring granular flow, *International Congress of Theoretical and Applied Mechanics* Chicago, Illinois.

Hill, K.M. N. Jain, J. M. Ottino (2000) Axial segregation patterns in non-circular tumbling mixers, *International Congress of Theoretical and Applied Mechanics* Chicago, Illinois.

Hill, K. M., N. Jain, J. M. Ottino. (2000) Segregation patterns in non-circular rotating drum mixers, *March Meeting of the American Physical Society* Minneapolis, Minnesota.

Hill, K. M., J.F. Gilchrist, D.V. Khakhar, J.M. Ottino (1999) Signatures of chaos in 2d tumbling mixers interplay between chaos, segregation, and mixing, *ICTAM* Cape May, New Jersey.

Hill, K. M., J.F. Gilchrist, D.V. Khakhar, J. J. McCarthy, J.M. Ottino (1998) Interaction between chaos and segregation in granular materials, *American Physical Society, Division of Fluid Dynamics* Newark, Philadelphia, Pennsylvania.

Hill, K. M., J.E. Martin, D.A. Adolf. (1998) Rheology of colloidal aggregates, *Materials Research Society Spring Meeting* San Francisco, California.

Hill, K. M., J.E. Martin, C.P. Tigges.(1998) Field-induced optical transmittance in magnetorheological fluids, *March Meeting of the American Physical Society* Los Angeles, California.

GRANTS RECEIVED FOR RESEARCH AND TEACHING

Years	Brief Title or Description	Source	Total Funding Allocated to KMH in parentheses
2000-01	Nuclear Magnetic Resonance Imaging of granular segregation	UWW Faculty Development Grant	\$6500 (All)
2001-02	Development of Granular segregation control	UIUC Research Board	\$25,500 (All)
2001-2002	Instructional demonstration equipment for TAM 212 and TAM 235	ISPE, Engineering Equip Grant	\$81,500 (\$22,700)
2001-2003	Redesign of TAM 235 toward a laboratory-driven course	UIUC AE3 ARC grant	\$30,000 (All)
2002-2003	Instructional demonstration equipment for TAM 212 and TAM 235	ISPE, Engr. Equip Grant	\$ 59,000 (\$50,500)
2003-2005	Second Generation Digital Mathematics Resources with Innovative Content for Metadata Harvesting and Courseware Development	NSF	\$ 796,000 (\$50,000 and one RA / year)
2004-2008	REU Site: Mechanics of Complex Materials	NSF	\$212,764 (1 month summer salary and some undergraduate research assistants)
2006-2008	Mechanistic Modelling of the DCP test for Unbound Materials	LRRB, MN DOT	\$105,000 (Co-PI: Lev Khazanovich)
2006-2008	Segregation and Mixing in Unsteady Particle-Laden Flows	Grant-in-Aid Program, U of Minn	\$26,819 (All)

2006-2009	Collaborative Research: Development of a Three-Dimensional Sensing System for Applications in Materials, Environmental, and Civil Infrastructure Research	NSF	\$381,000 (\$127,000); PI: J. Bernhard, UIUC and other co-PI: S. Hagness, UW-Madison
2008-2011	Multi-scale studies on the effects of fluid and bed variability on particle entrainment and transport	NSF	\$295,901 (Co-PI is F. Porte-Agel)
2009-2012	Rheology of Dense Sheared Granular Mixtures: Computational and experimental studies on the effects of particle size distributions	NSF	\$300,000
2010-2012	Quantifying Moisture Effects in DCP and LWD Tests Using Unsaturated Mechanics	LRRB, MN DOT	\$109,900 (Co-PI: Lev Khazanovich)

PROFESSIONAL ACTIVITIES, National

Professional Meeting Organization

Chair of the Session Mechanics Committee: Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Chicago, Illinois, November, 2005

Session Organizer, Mini-symposium on Granular Materials: Interconnecting Engineering and Physics Perspectives, EM08 to be held in Minneapolis, May, 2008

Organizing Committee, Meeting of the American Physical Society, Division of Fluid Dynamics

Professional Committee Work

Vice-Chair, External Affairs Committee, American Physical Society, Division of Fluid Dynamics, 2006-2007

Chair, External Affairs Committee, American Physical Society, Division of Fluid Dynamics, 2008

Member, Executive Committee, Earth and Planetary Surface Processes Focus Group, American Geological Union, 2010-present.

Chair, Meetings Committee, Earth and Planetary Surface Processes Focus Group, American Geological Union, 2010-present.

Member, Joint Fellows Focus Group Committee, American Geological Union, 2010-present.

Proposal Review Panels

National Science Foundation, May, 2005, May, 2006, May 2007, May 2008, Jan 2009, December 2010

Petroleum Research Board 2007, 2008

Army Corps of Engineers 2007

Reviewer for Professional Journals

Europhysics Journal

Mechanics of Materials

Physical Review Letters

Physical Review E

Granular Matter

PROFESSIONAL ACTIVITIES at UMN

Department

Member, Graduate Studies Committee 2005- 2009

Member, Safety Committee 2005-present

Administrator of Preliminary Written Examination for the Water Resources Group 2006 – present

Chair, SAFL Awards Committee 2005-present

College

Representative for the Department of Civil Engineering: Institute of Technology Instructional Computing Committee (IT-ICC) 2008-2010

PROFESSIONAL ACTIVITIES at UIUC

Department

Member, Undergraduate Program and Curriculum Committee, 2001-2002

Chair, Undergraduate Program and Curriculum Committee 2002-2003, 2003-2004, 2004-2005

Member, Committee for Exhibits, Tours and Open Houses, 2001-2002, 2002-2003, 2003-2004, 2004-2005

Organizer for Undergraduate Research Opportunities in Mechanics, Fall of 2002, 2003, 2004

Organizer for Undergraduate Research Conference in Mechanics, Spring of 2002, 2003, 2004, 2005

Member, Award Committee, 2005

College

Panel for Engineering Your Future (EYF) Fall 2001

Panel for Women in Engineering Program (Engr. 199W)

Women in Math, Science, and Engineering living/learning community (WIMSE) Faculty Dinner Series (Fall, 2002)

Engineering Advisory Board Meeting Fall, 2002

Member, Subcommittee on Teaching Evaluation and Improvement, 2002-2003, 2003-2004, 2004-2005

Member, Ad-hoc Committee on evaluation of new research course sequence proposed by the Physics Department

Engineering Majors Fair, 2003, 2004, 2005

PROFESSIONAL ACTIVITIES at UW-W

Department

Member, Long-term planning committee, 1999-2001

Member, Major-Minor committee, 1999-2001

Member, Search committee for physics education position, 1999-2000

Member, Search committee for physics position, 2000-2001

Advisor, Sigma Pi Sigma, 1999-2001

Chair, Seminar series, 2000-2001

Five-year joint Engineering / Physics degree program with UW Milwaukee, 2001

Community

Fort Atkinson Science Fair, 2000

COURSES TAUGHT

General Physics I, UW-W (enrollment ~35) – Introduction to Physics I for non-physics science majors

General Physics I Laboratory, UW-W (enrollment ~30)

Introductory Physics I , UW-W (enrollment ~45) – Introduction to Physics I for physics majors
 Introductory Physics Laboratory I, UW-W (enrollment ~40)
 Introductory Physics II, UW-W (enrollment ~20) – Introduction to Physics II for physics majors
 Introductory Physics Laboratory II, UW-W (enrollment ~15)
 Introductory Physics III, UW-W (enrollment ~15) – Introduction to Physics III for physics majors
 Introductory Physics Laboratory III, UW-W (enrollment ~15)
 Mechanics I, UW-W (enrollment ~10) – Junior-level Mechanics for physics majors
 Science Technology and Society, UW-W (enrollment ~60) – General Introductory Science Course for all students
 Engineering Mechanics I – Statics, UIUC (enrollment ~200 or ~600, depending on the semester) – Sophomore-level statics for engineering majors
 Engineering Mechanics II – Dynamics, UIUC (enrollment either ~150 or ~350, depending on the semester) – Sophomore-level dynamics for engineering majors
 Design and Analysis in Engineering Practice, UIUC (enrollment ~10) – Junior-level design course for engineering mechanics majors
 Advanced Dynamics, UIUC (enrollment ~30) – Upper-level undergraduate / lower level graduate vibrations and rigid body dynamics, primarily for engineering advanced undergraduates or graduates, generally in mechanics or mechanical engineering
 Computer Applications for Civil Engineers, UMN (enrollment ~60) – Introduction to numerical methods and computer applications for Civil Engineering undergraduates; also significant scientific / engineering writing instruction component
 Environmental Fluid Dynamics II (enrollment ~10) – Turbulent Boundary Layer Fluid Dynamics; second course on fluid dynamics for graduate students
 Granular Physics: Applications for the environment (enrollment ~10) – Granular physics with application to the environment from sediment transport to debris flows for graduate students.
 Sediment Transport (enrollment ~ 10) – Sediment transport for graduate students and practitioners
 Fluid Mechanics (enrollment ~ 100) – Lecture and laboratory course for junior level civil engineering students introducing the students to basic and applied principles in fluid mechanics

GRADUATE RESEARCH ADVISING

Year Granted or Anticipated	MS Thesis Student	Project Title
December, 2003 (granted)	Deepak Raghukula Amaravadi	Wavy Radial Segregation Patterns in Rotated Granular Mixtures
May, 2004 (granted)	Andrew Leven Harrison	Laminarity of Dense Granular Flow in Chute Flow
2007 (granted)	Leslie DellAngelo	Segregation in Particle-Laden Flow - applications to Stream Restoration
2008 (granted)	Bereket Tewoldrebrahn	Discrete Element Modelling of the Dynamic Cone Penetration Test
2008 (granted)	Jeho Yoo	The Curious Case of Mobility Reversal: the Effects of Slope and Unsteady Flows
2009 (anticipated)	Greg Shaffer	Turbulence Characterization of Roughness Transitions in Open Channel Flow
2009 (anticipated)	Meghan Flanagan	Sediment Transport in the Context of Roughness Transitions in Open Channel Flow

2009 (anticipated)	John Gaffney	Impingement of Fines on Gravel Bed Rivers: Unstable Slopes and Embeddedness
Year Granted or Anticipated	Ph.D. Thesis Student	Project Title
2009 (granted)	Jiafeng Zhang	Kinematics of Binary Particulate Mixtures in Dense Flow
2011 (anticipated)	Fan Yi	Proposed: Sensor particle development and segregation in sheared media
2011 (anticipated)	Bereket Yohannes	Proposed: Multiphase modeling and experiments in dense granular flows and debris flows

UNDERGRADUATE RESEARCH ADVISING

Student (dates)	Project Title
Scott Sievert (2011)	Segregation in Slurries with Applications to Debris Flows
Margaret Wright (2010)	Fine particle infiltration to gravel beds
Zhen Sun (2008-2009)	Mechanics of Intruder Particles in Bulk Granular Flow
Tom Mooney (2008)	Crater Dynamics in Granular Materials
Michael Cremin (2007-2008)	Stochastic Motion of Different Sized Tracer Particles in a Gravel-Bed Laboratory Flume: Experiments and Model Development
Luis Berrospid (2006-2007)	Particle Transport in Gravel Bed Rivers
Hallie Boyer (2006)	Flow-Dependent Segregation Studies
Navneet Agarwal (2006)	Adaptation of the Discrete Element Method for the Dynamic Cone Penetrometer Pavement Test
David Grayson (2005)	Gravity and solid-like resistance of granular materials
John Corboy (2005)	Particle Sensors and adjacent excavation
Samuel Valdivia(2005)	Particle Sensors and particle segregation by shaking
Kenway Chen (2005)	Granular segregation and interstitial fluids
Linus Trippe (2004-2005)	Structure of Granular Flow in Narrow Channels
Michael Ly (summer, 2004)	The Dependence of Slurry Flow on the Fluid Viscosity
Sophie McGough (summer, 2004)	Velocities of Granular Flow in Narrow Channels
Varun Mittal (2003-present)	Statistics of Particle Trajectories in Steady Dense Granular Flow
Stephanie Ott-Monsivais (2002-2005)	Velocity Fluctuations in Dense Granular Flow
Cara Winter (2002-2003)	Wavy Radial Segregation in Granular Materials – Wavelength Tuning
Robert Vlach (2003-2004)	Segregation in Unsteady Granular Flows
Adam Cobb (2003-2004)	TAM Toys as teaching tools
Diana Jasoriwicz (2003-2004)	Near Wall Lift and Drag forces on a Particle

Brian Seguin (Fall, 2003)	Dynamics of the Russian Rattleback
Clarence Dienberg (2002-2003)	Lift and Drag and an Automobile diffuser
Ki Kim (2002-2003)	Miniature Wind Tunnel Demonstration Experiments
Adan Castillo (summer – fall, 2002)	Forced Segregation patterns in Granular Materials
Sarah Hussain (summer, 2002)	Interactive Demonstrations for Dynamics Education
Mike Acevedo (summer, 2002)	Axial Segregation of Granular Slurries – Fluid Viscosity Dependence
Karina (Yuen) Wong (2001-2002)	Fill level dependence of Radial Segregation Patterns
Vinay Tota (2001-2002)	Velocity Fluctuations in Dense Granular Flow
Hillary Esserine (Fall, 2001)	Striped Radial Segregation Patterns in Granular Mixtures – Rate Dependence
Rosa Liana (2000-2001)	Granular Segregation Studies in Non-Circular Mixers
John Keegan (2000-2001)	Segregation in Unsteady Granular Flows
Cecile Medina (Summer, 2000)	Axial segregation of Slurries
Dwight Hunter (2000-2001)	3-D Imaging of Granular Segregation: Chaotic Advection and Axial Banding in Rotating Drums
Andrew Bowers (1999-2000)	Segregation Studies in Avalanching Flow
David Tanzer (Fall, 2000)	Segregation in a Rotating Drum – particle density vs. size differences
Nycletha McCarthy (Spring, 2000)	The Interplay between Chaotic Dynamics and Axial Segregation
Neal Sheory (Fall, 1999-Spring, 2000)	Density Dependence of Chaotic Granular Segregation Patterns
James Koepppe (1996-1997)	Granular Segregation in Avalanche Flows
Laura Yarusso (1995)	Axial Segregation Speed Dependence

TEACHING DEVELOPMENT

Primary Training Programs

- Preparing Future Faculty (U of Minnesota teaching development course)
- University of Wisconsin Teaching Conference
- University of Illinois FAST Start Program (Teaching College Faculty Development Program)

Primary Teaching Development Activities

- Designed new modern physics course for non-science majors (UW-W)
- Developed student-active group learning activities for STS course and physics courses (UW-W)
- Developing interactive lecture demonstrations for Introductory Dynamics and Solid Mechanics engineering courses (UIUC)
- Developing online interactive tools for Introductory Dynamics and Solid Mechanics courses (UIUC)
- Developing online demonstrations for Introductory Fluids course (UIUC)

CONSULTING ACTIVITIES

- Intellectual Property Case contracted by Merchant & Gould for Cambria, August-October 2006
- Mixing of Powders for Kimberly Clark Corporation, Neenah, WI, March 2000-2002
- Textbook content for McGraw-Hill, Chicago, IL October, 2002