

June, 2015

**CHARLES S. CAMPBELL**

**EDUCATION**

Ph.D. (1982), M.S. (1978) Mechanical Engineering California Institute of Technology,  
Pasadena, CA 91125

B.A. (1977) Mathematics  
Vassar College, Poughkeepsie, NY 12601

**EMPLOYMENT**

Professor (1998- )  
Associate Professor (1989-97)  
Assistant Professor (1983-89)  
Department of Mechanical Engineering  
University of Southern California  
Los Angeles, CA 90089-1453

Visiting Associate (1995-2003)  
California Institute of Technology  
Pasadena, CA 91125

Project Engineer (1982-83)  
Systems Laboratory  
Space and Communications Group  
Hughes Aircraft Company  
El Segundo, CA 90009

**PROFESSIONAL INTERESTS**

Fluid Mechanics, Heat Transfer, Multiphase Flows,  
Solid Fracture, Combustion

**RESEARCH EXPERIENCE**

Granular Material Flows and Heat Transfer, Slurry Flows, Fluidized Bed Mechanics,  
Solid Fracture Modeling, Comminution, Landslides, Boiling Heat Transfer,  
Fluid Mechanics of the Coronary Arteries, Combustion

**PROFESSIONAL SOCIETIES**

American Society of Mechanical Engineers  
American Physical Society

## **HONORS AND AWARDS**

AME Fellow (elected 2011)  
1990 Kona Award  
(Given at the Second World Congress  
on Particle Technology for achievements  
in the field by a scientist under 36 years  
of age. CSC was the premier recipient.  
Financed by the Hosokawa Micron Co.)  
1984 Presidential Young Investigator Award  
(National Science Foundation)  
IBM Faculty Development Award  
USC University Scholar  
R.T. Baker Fellowship (Caltech)  
Phi Beta Kappa (Academic Honors Society, Vassar)  
General Honors (Vassar)  
Mathematics Department Honors (Vassar)  
Mary Evelyn Wells and Gertrude Smith Prize for Excellence  
in the Study of Mathematics (Vassar)  
Honorary Vassar College Fellowship

## **COURSES TAUGHT**

AME 310 Engineering Thermodynamics  
AME 331 Heat Transfer  
AME 457 Engineering Fluid Dynamics  
AME 516 Convection Processes  
ME 519 Advanced Fluid Mechanics  
AME 533 Multi-Phase Flows  
AME 525 Engineering Analytical Methods I  
AME 526 Engineering Analytical Methods II

## **SCIENTIFIC JOURNALS REVIEWED**

Journal of Fluid Mechanics  
ASME Journal of Applied Mechanics  
International Journal of Heat and Mass Transfer  
Physics of Fluids  
Journal of Rheology  
Acta Mechanica  
Mechanics of Materials  
International Journal of Multiphase Flows  
ASME Journal of Heat Transfer  
Powder Technology  
AIChE Journal  
ASCE, Journal of Engineering Mechanics  
International and ASME Heat Transfer Conference Proceedings ASAE Journal  
Sedimentology

Continuum Mechanics and Thermodynamics  
AIAA Journal  
Physical Review  
Physical Review Letters  
Chemical Engineering Science  
Aerosol Science

### **CONSULTING ACTIVITIES**

U.S. Department of Energy  
InXitu  
General Motors  
The Jasons  
RDA  
Koninklike/Shell-Labotorium, Amsterdam  
Dykema Engineering  
J. T. Thorpe  
Roberts Engineering  
Market Match  
America's Funniest Home Videos

### **PROPOSALS REVIEWED FOR**

National Science Foundation  
ARO  
AFOSR  
NRO  
Department of Energy  
Petroleum Research Fund  
Cornell Supercomputer Center  
Israel Academy of Sciences  
National Research Council of Canada

### **RESEARCH GRANTS**

(sole P.I. unless noted)

NSF Presidential Young Investigator Award: "Dynamics of Particle Flows", 8/1/84- 7/31/89, \$445,558  
Includes matching funds provided by:  
IBM, Faculty Development Award, \$60,000  
TRW, \$25,000  
Ralph Parsons Foundation, \$10,000  
International Fine Particle Research Institute, \$60,000  
Sun Microsystems, \$5279  
IFPRI/NSF Collaboratory, 3/2011-3/2012, \$15,000  
NSF, Unifying Granular Flows, 10/1/2008-9/30/2011,\$300,000  
Utah Nanocatalysts In Propulsion: Mechanisms And Optimization, 3/1/2008-2/28/2010  
with Wang, H., Phares, D. \$630102.00, Participation 33%  
AFOSR, Development of Detailed and Reduced Kinetic Mechanisms for Surrogates of Petroleum-Derived and Synthetic Jet Fuels 3/1/2008-11/30/2010,\$2,100,000.00 Participation 25%

NASA, "Detailed Studies on the Structure and Dynamics of Reacting Dusty Flows at Normal- and Micro-Gravity", (With F. Egolfopoulos), 6/1/96-5/31/00 \$372,583  
NASA, "Granular Material Flows with Interstitial Fluid Effects," (with M. Hunt and C.E. Brennen,) 2/15/00- 11/1/03, \$309,991  
ISSI, Pulsed Non-equilibrium Plasma Ignitor, 10/1/02-8/31/03 (with F. Egolfopoulos) \$33,000.  
NSF, "Fluidization Mechanisms in Slurry Flows", 10/1/89-9/30/92 \$316,000  
DOE, "Particle Pressures in Fluidized Beds", 9/1/91-8/31/96, \$339,452  
General Motors, "A Preliminary Study of Lost Foam Compaction Systems", 6/1/94- 6/1/95 \$51,488  
General Motors, "Compaction Studies: Phase II, 6/1/96- 12/31/96 \$51,939  
International Fine Particle Research Institute, "Computer Simulation of Powder Flows", 11/1/88-10/31/97 , \$274,000  
DOE, "Mechanics/Heat- Transfer Relationship for Particle Flows" 9/1/88-8/31/91, \$200,000  
DOE, "Fluidization Mechanisms in Slurry Flows", 10/1/86-9/30/88, \$200,000  
NSF, "Critical Behavior of Transport and Mechanical Properties in Disordered Solids and Particulate Dispersions", (with Professors Goddard,(P .I.) Sahimi and Bardet),6/1/87-5/31/90, \$254,000  
AFOSR, "Critical Behavior of Transport and Mechanical Properties in Particulate Dispersion and Granular Media", (with Professors Goddard, (P.I.) Sahimi and Bardet, 4/1/87-3/31/88, \$60,000  
NSF, Research Initiation Grant, "Heat Transfer to Particulate Materials", 6/1/84-6/1/86, \$60,000

## **USC SERVICE**

Undergraduate Advisor (12 years)  
Graduate Advisor  
Curriculum Committee, 1986-present  
USC University Scholar Committee  
Machine Shop Committee  
Space Committee  
Ae/ME Unification Committee  
Merit Review Committee  
Faculty Senator  
Engineering Faculty Council 1985-1986, 2007-2011  
Academic Programs Committee, 2009 (Chair)  
Best Practices Committee, 2008  
Ad hoc committee on (MS) grading practice/grade inflation, 2010-2012 (Chair)

## **MISCELLANEOUS EXTERNAL SERVICE**

Organizer: 1991 US- Japan Conference on the Micromechanics of Granular Materials  
Organizer: 1993 Meeting of the International Fine Particle Research Institute

Guest Editor: *Mechanics of Materials*, Vol. 16, Nos. 1-2  
Editorial Boards: *Advanced Powder Technology*, and *Granular Matter*

## INVITED PRESENTATIONS

Computer Simulation of Granular Flows, for Kinetic Theory of Planetary Rings, Cornell University, May 1987 ,  
Fluid/Solid Interfaces in Granular Flows, Geophysical Grain Flows, La Jolla, Ca. July, 1989  
Self-lubrication for Long Runout Landslides, Workshop on Giant Long-Runout Landslides on the Earth, Moon and Mars, Caltech, March, 1990  
Particle Pressures in Gas-Fluidized Beds, Georgia Tech, April 1990  
Particle Pressures in Gas-Fluidized Beds, Duke University, April 1990  
Computer Simulation of Granular Flows, Duke University , April 1990  
Computer Simulation of Granular Flows, The Jasons, La Jolla, Ca., June 1990  
Particle Pressures in Gas-Fluidized Beds, Kona Award Commemorative Lecture, Hosokawa Micron Corporation, Osaka Japan, September, 1990  
Self-lubrication for Long Runout Landslides, Second Workshop on Giant Avalanches, USSR Academy of Sciences, Moscow, USSR, October, 1990  
Discrete- Particle Flow Simulations, Koninklike/Shell- Labotorium, Amsterdam, November, 1990  
Computer Simulations of Large Landslides, Third Workshop on Giant Avalanches, Caltech, March 1991  
Two Studies of Transport Processes in Particulate Systems, Princeton University, April, 1991  
Two Studies of Transport Processes in Particulate Systems, Johns Hopkins University, April, 1991  
Particle Pressures in Gas-Fluidized Beds, IUTAM Symposium on the Mechanics of Fluidized Beds, Stanford University, July, 1991  
Interfaces between Fluid-like and Solid-like Behavior in Granular Flows, US-Japan Seminar on the Micromechanics of Granular Materials, Potsdam, NY August 4-9, 1991  
Two Studies of Transport Processes in Particulate Systems, Caltech, October, 1991  
Boundary Interactions for Granular Flows, USC, November, 1991  
Two Studies of Transport Processes in Particulate Flows, UCSD, February, 1992  
Two Studies of Transport Processes in Particulate Systems, Carnegie Mellon, March, 1992  
Two Studies of Transport Processes in Particulate Systems, USC, November, 1992  
Computer Simulation of Hopper Flow, International Energy Agency Symposium on Granular Flows in Complex Geometries, Albuquerque, NM, August, 1994  
Rapid Granular Flows? , Plenary lecture, Powder Flow Symposium, AIChE meeting, San Francisco, CA, November, 1994  
Computer Simulation of Particle Breakage, California Institute of Technology, February, 1996  
Solid Particle Science, Vassar College, April, 1997  
Large-scale Landslide Simulations, Columbia University , August, 1997  
Large-scale Landslide Simulations, USC, September 1997

Large-scale Landslide Simulations, University of California Riverside, October, 1997  
 Large-scale Landslide Simulations, Caltech, February, 1998  
 Granular Flows: A Somewhat Personal Perspective, University of Florida, May, 1998  
 Large-scale Landslide Simulations, Palos Verdes Unified School District, July 1998  
 Granular Flows: A Somewhat Personal Perspective, University of Illinois, Urbana, March, 1999  
 Computer Simulation of Particle Breakage, University of Minnesota, May, 1999  
 Microscopic Modeling of Liquid-Particle Flows, IFPRI Annual Meeting, Sommerville, NJ June, 1999  
 Macroscopic Modeling of Fluidized Beds, IFPRI Annual Meeting, Sommerville, NJ June, 1999  
 Granular Flows: A Somewhat Personal Perspective, MRS Meeting, 1999  
 Elastic Granular Flows, Geophysical and Particle Laden Flows, Bristol England, October, 2003  
 Elastic Granular Flows, Surrey University, Guildford England, 2003  
 Elastic Granular Flows, IX Congreso, División de Dinámica de Fluidos, Mexico City, November, 2003  
 Campbell, C.S. Granular Flows and Gas Fluidization, In *Fluidization XI*, Ischia Italy, May, 2004  
 Campbell, C.S., Granular Flows, a lecture to the Ohio State summer Powder Technology class. August, 2004  
 Elastic Granular Flows, Kavli Inst of Physics, Santa Barabara, April 2005,  
 Elastic Granular Flows, Workshop on the Role of Volatiles and Atmospheres on Martian Impact Craters, Laurel Md, July, 2005  
 Elastic Effects on Granular Flows, Purdue University, West Lafayette, In, October, 2005  
 Elastic Granular Flows, APS March Meeting, Baltimore, 2006  
 Elastic Granular Flows, UCSC, May, 2007  
 Elastic Granular Flows, Gordon Conference on Granular Flow, Colby College, June 2008

## INVITED PAPERS

Campbell, C.S. & Brennen, C.E., Computer simulation of chute flows of granular material, Proceedings of the IUT AM Symposium on Deformation and Failure of Granular Materials, A. A. Balkem Publishers, Rotterdam.

Campbell, C.S., Computer simulation of rapid granular flows, *Proc. 10<sup>th</sup> US National Congress of Applied Mechanics*, Austin Texas, June 1986, ASME, New York, 327-38

Campbell, C.S., Boundary interactions for two-dimensional granular flows: asymmetric stresses and couple stresses in *Micromechanics of Granular Materials*, Proceedings US-Japan Seminar on the Micromechanics of Granular Material, Sendai-Zao, Japan, October 26-30, 1987, Elsevier, pp 163-174

Campbell, C.S., Rapid granular flows, *Annual Review of Fluid Mechanics*, 22 (1990) 57-92

Campbell, C.S., & Zhang, Y., Interfaces between fluid-like and solid-like behavior in granular flows, in *Advances in Micromechanics of Granular Materials -Proceedings of the Second US./Japan Seminar on the Micromechanics of Granular Materials, Potsdam New York, August 5-9, 1991*, (H.H. Shen, M. Satake, M. Mehrabadi, C.S. Chang, C. S. Campbell, eds.), Elsevier, Amsterdam, 1992,261- 70

Campbell, C.S., Recent Applications of Computer Simulation of Granular Systems, *Discrete Particle Simulations in Powder Technology*, NEPTIS-1, Sponsored by Nisshin Engineering Company, Osaka Japan, January 18-20,1993,27-31

Campbell, C.S. Granular Flow in the Elastic Limit, In *The Granular State*, ed by S. Sen and M. L.. Hunt, Materials Research Society, Warrendale, PA, 2001, BB4.4.1-BB4.4.12

Campbell, C.S. Granular Flows and Gas Fluidization, In *Fluidization XI*, (ed. by U. Arena, R. Chirone, M. Miccio, & P. Salatino), ECI NY, 21-36, 2004

## REFEREED JOURNAL PUBLICATIONS

Campbell, C.S. & Brennen, C.E., Chute flows of granular materials: some computer simulations, *J. App. Mech.* 52, (1985), 172-178

Campbell, C.S & Brennen, C.E., Computer simulation of granular shear flows, *J. Fluid Mechanics* 151, (1985) 167-188

Campbell, C.S., Brennen, C.E. & Sabersky, R.H., Flow regimes in inclined open channel flows of granular materials, *Powder Technology* 41 (1985) 77-82

Campbell, C.S. & Gong, A., The stress tensor in a two-dimensional granular shear flow, *Journal of Fluid Mech.* 164, (1986) 107-125.

Campbell, C.S., The effect of microstructure development on the collisional stress tensor in a granular flow, *Acta Mechanica*, 63 ( 1986), 61- 72

Campbell, C.S., The stress tensor for simple shear flows of a granular material, *Journal of Fluid Mechanics*, 203 (1989),449-473

Campbell, C.S., Self-lubrication for long runout landslides, *Journal of Geology*, 97 (1989) 653-665

Wang, D.G., Sadhal, S.S. & Campbell, C.S., Particle rotation as a heat transfer mechanism, *International Journal of Heat and Mass Transfer*, 32, (1989) 1413-1423

Zhang, Y. & Campbell, C.S., The interface between fluid-like and solid-like behavior in two-dimensional granular flows, *Journal of Fluid Mechanics*, 237, (1992) 541-568

Campbell, C.S. & Wang, D.G., Particle pressures in gas-fluidized beds, *Journal of Fluid Mechanics*, 227, (1991) 495-508

Campbell, C.S. & Wang, D.G., A particle pressure transducer suitable for use in gas-fluidized beds, *Measurement Science and Technology*, 1, (1990), 1275-1279

Campbell, C.S., Boundary interactions for two-dimensional granular flows, part I: flat boundaries, asymmetric stresses and couple stresses, *Journal of Fluid Mechanics*, 247 (1993) 111-136

Campbell, C.S., Boundary interactions for two-dimensional granular flows, part II: roughened boundaries, *Journal of Fluid Mechanics*, 247 (1993) 137-156

Wang, D.G. & Campbell, C.S., Reynolds' analogy for a shearing granular material, *Journal of Fluid Mechanics*, 244 (1992) 527-546

Campbell, C.S., Impulse strengths in rapid granular shear flows, *Acta Mechanica*, 104 (1994) 65-90

Campbell, C.S., & Rahman, K., An improved particle pressure transducer, *Measurement Science and Technology*, 3 (1992) 709-712

Cleary, P. W., & Campbell, C.S., Self-lubrication for long runout landslides: examination by computer simulation, *J. Geophysical Res. B. Solid Earth*, 98 (1993) 21,911-924

Potapov, A.V., Hopkins, M.A. & Campbell, C.S., A two-dimensional dynamic simulation of solid fracture part I: description of the model, *Int. J. Mod. Phys. C*, 6 (1995) 371-398

Potapov, A.V., Campbell, C.S. & Hopkins, M.A., A two-dimensional dynamic simulation of solid fracture part II: examples, *Int. J. Mod. Phys. C*, 6 (1995) 399-425

Campbell, C.S., Cleary, P., & Hopkins, M.A., Large landslide simulations: global deformation, velocities and basal friction, *J. Geophysical Res.*, 100 (1995) 8267-8283

Egolfopoulous, F.N. & Campbell, C.S., On the structure and dynamics of unsteady, counterflowing, strained diffusion flames. diffusion limited frequency response, *J. Fluid Mech.*, 318 (1996), 1-29

Potapov, A. V. & Campbell, C.S., Computer simulation of impact induced particle breakage, *Powder Technology*, 81, (1994) 207-216

Potapov, A.V. & Campbell, C.S., A hybrid finite-element model for solid fracture, *Int. J. Mod. Phys. C*, 7 (1996) 155-180

Potapov, A. V. & Campbell, C.S., Computer simulation of hopper flows, *Physics of Fluids A*, 8 (1996) 2884-2894



- Potapov, A. V. and Campbell, C.S., A three-dimensional simulation of brittle solid fracture, *Int. J. Mod. Phys. C*, 7 (1996),717-730.
- Potapov, A. V. and Campbell, C.S., Propagation of elastic waves in deep vertically shaken particle beds, *Phys. Rev. Lett.*, 77 (1996) 4760-4763
- Siebes, M., Campbell, C.S., & D'Argenio, D.Z., Fluid dynamics of a partially collapsible stenosis in a flow model of the coronary circulation, *ASME J. Biomechanical Eng.*, 118 (1996) 489-497
- Campbell, C.S., Self-diffusion in granular shear flows, *Journal of Fluid Mechanics*, 348 (1997),85-101
- Potapov, A. V. & Campbell, C.S., The two mechanisms of particle impact breakage and the velocity effect, *Powder Technology*, 93 (1997) 13-21
- Potapov, A. V. & Campbell, C.S., Computer simulation of shear-induced particle attrition, *Powder Technology*, 94 (1997) 109-122
- Potapov, A. V. & Campbell, C.S., A fast model for the simulation of non-round particles, *Granular Matter*, 1 (1998) 9-14
- Egolfopoulos, F.N. & Campbell, C.S., Dynamics and structure of dusty reacting flows: inert particles in strained, laminar, premixed flames, *Combustion and Flame*, 117 (1999), 206-226
- Sadjadpour, M. & Campbell, C.S., Investigation of cohesionless granular material flow regimes in inclined open channels, *Advanced Powder Technology*, **10** (1999) 175-186
- Potapov, A. V. & Campbell, C. S., The breakage induced by a single grinding ball dropped onto a randomly packed particle bed, *Powder Technology*, **107** (1999) 108-117
- Andac, M.G., Egolfopolous, F. Campbell, C.S. and Lauvergne, R., Effects of inert dust clouds on the extinction of stained laminar flames, *Proceedings of the Combustion Institute* 28, (2000) 2921-2929
- Jin, J. C. & Campbell, C.S., Constitutive parameters for liquid fluidized beds, *Int. J. Multiphase Flow*, **27** (2001), 1823-1827
- Potapov A.V., Hunt M.L. & Campbell C.S., Liquid-solid flows using smoothed particle hydrodynamics and the discrete element method, *Powder Technology* **116** (2001) 204-213.
- Potapov, A. V. & Campbell, C. S., Parametric dependence of particle breakage mechanisms, *Powder Technology*, **120** (2001) 164-174

- Hunt, M.L., Zenit, R., Campbell, C.S. & Brennen, C.E., Revisiting the 1954 suspension experiments of R. A. Bagnold, *J. Fluid Mechanics* **452** (2002) 1-24
- Rahman, K. & Campbell, C.S., Particle pressures generated around bubbles in gas-fluidized beds, *J. Fluid Mech.*, **455** (2002), 103-127
- Campbell, C. S., Granular shear flows at the elastic limit, *J. Fluid Mech.*, **465** (2002) 261-291
- Andac, M.G., Egolfopoulos, F., & Campbell, C.S., Premixed flame extinction by inert particles in normal and microgravity, *Combustion and Flame*, **129** (2002) 179-91
- Goldshtein A., Kamenetsky V., Potapov A., Shapiro M., Campbell C. and Degani D. Hydrodynamics of Rapid Granular Flow of Inelastic Particles into Vacuum. *Granular Matter* **4** (2002) 115-127
- Egolfopoulos, F.N., Campbell, C.S. and Andac, M.G., Hot Particle Ignition of Methane Flames, *Proc. Combustion Inst.* **29** (2003) 1605-1612
- Andac, M.G., Egolfopoulos, F.N. and Campbell, C.S., Effects of Reacting Particles on Flame Extinction, *Proc. Combustion Inst.* **29** (2003) 1487-1493
- Campbell, C.S., A problem related to the stability of force chains, *Granular Matter*, **5**, (2003) 129-134
- Campbell C.S., Avila-Segura F, Liu Z, Preliminary observations of a particle lift force in horizontal slurry flow, *International Journal Of Multiphase Flow* **30** (2004) 199-216
- Andac, M. A., Egolfopoulos, F. N., Campbell, C. S. and Lee, J.C., Effects of Combustible Dust Clouds on Premixed Flame Extinction, *Proc Comb. Inst.*, **30**, (2005) 2369-2377
- Andac, M. A., Egolfopoulos, F. N. and Campbell, C. S, Hot-Gas Ignition of Non-Premixed Methane Flames in the Presence of Inert Particles, *Proc Comb. Inst.*, **30**, (2005) 431-437.
- Campbell, C.S., Stress-controlled elastic granular shear flows, *J. Fluid Mech.* **539** (2005) 273-297.
- Campbell, C. S. and Egofopoulos, F. N., Kinetics Paths to Radical-Induced Ignition of Methane/Air Mixtures, *Combustion Science and Technology*, **177** (2005), 2275-2298
- Campbell, C.S. Granular Flows: an Overview, *Powder Technology*, **162** (2006) 208-229
- Klongboonjit, S and Campbell C. S. Convection in Deep vertically shaken particle beds, Part I: General Features, *Physics of Fluids*, **20**, 103301 (2008)

Klongboonjit, S and Campbell C. S. Convection in Deep vertically shaken particle beds, Part II: The relationship between convection and internal wave propagation, *Physics of Fluids*, **20**, 103302 (2008)

Klongboonjit, S and Campbell C. S. Convection in Deep vertically shaken particle beds, Part III: Convection Mechanisms, *Physics of Fluids*, **20**, 103303 (2008)

Abid, A.D., Heinz, N., Tolmachoff, E.D., Phases, D.J., Campbell, C.S., Wang, H., On Evolution of Particle Size Distribution Functions of Incipient Soot in Premixed Ethylene-Oxygen-Argon Flames, *Combustion and Flame*, **154** 775-788 2008.

Tolmachoff, E.D., Abid, A.D., Phases, D.J., Campbell, C.S., Wang, H., Synthesis of Nano-Phase TiO<sub>2</sub> Crystalline Films over Premixed Stagnation Flames, *Proc Comb. Inst.*, **32** 1839-1845, 2009.

Campbell, C.S. Elastic Granular Flows of Ellipsoidal Particles, *Physics of Fluids*, **23**, 013306, 2011.

Campbell, C.S., Clusters in dense-inertial granular flows, *Journal of Fluid Mechanics*, **687**, 341-359, 2011.

Campbell, C.S., Clusters in Dense-Inertial Granular Flows: Two New Looks at the Conundrum, *Granular Matter*, **16**, 621-626, 2014.

## **REFEREED CONFERENCE PUBLICATIONS**

Campbell, C.S. & Wang, D.G., Effective conductivity of shearing particle flows, *Proceedings, 8th International Heat Transfer Conference, San Francisco, Ca. USA, August, 1986, Vo15, 2567-2572*

Campbell, C.S. & Gong, A., Boundary conditions for two-dimensional granular flows, *Proceedings Sino-US International Symposium on Multiphase Flows, Hangzhou, China, August, 1987, Volume 1, 278-283*

Campbell, C.S. 1999, Granular flows in the elastic limit, to appear in IAS Special Publication: Sediment Transport and Deposition by Particulate Gravity Currents, *proceedings of the conference on Particular Gravity Currents, Leeds, England, September, 1998.*

Campbell, C.S., 2009, Elastic Flows of Ellipsoidal Particles, Powders and Grains, Colorado School of Mines, Golden, CO, July 13-17, 2009. AIP Conference Series, Vol. 1145, 591-594

## OTHER CONFERENCE PUBLICATIONS

Campbell, C.S. & Brennen, C.E., Computer simulation of shear flows of granular material, in *Mechanics of Granular Materials: New Models and Constitutive Relations*, J. T. Jenkins and M. Satake eds., Elsevier Scientific Publishers, Amsterdam, 1982

Campbell, C.S., A technique for determining the fluidization mechanism in horizontal slurry flow, in the Proceedings of the Solids Transport Contractors Review Meeting, US Department of Energy, Sept. 17-18, 1987, Pittsburgh, Pa., 68-76

Campbell, C.S. & Avila-Segura, F.E., Fluidization mechanisms in horizontal slurry flow, in the Proceedings of the Solids Transport Contractors Review Meeting, US Department of Energy, Sept. 22-23, 1988, Pittsburgh, Pa.

Zhang, Y & Campbell, C.S., Eroddable boundaries in granular flow, *Proc. Second World Congress on Particle Technology*, Kyoto, Japan, September, 1990, Part II, 166-173

Campbell, C.S., & Avila-Segura, F., Particulate fluidization in horizontal slurry flow, Proceedings of the NSF-DOE Workshop on Flow of Particulates and Fluids, Gaithersburg, Md., October 1-3, 1990, 167-176

Campbell, C.S., Avila-Segura, F., & Yang, Y., Fluidization of particles in horizontal slurry flow, Proceedings of the NSF-DOE Workshop on Flow of Particulates and Fluids, Worcester, Ma., October 23-24, 1991, 41-50

Goddard, J.D. & Campbell, C.S., Anisotropic diffusion in linear shear flows, Paper 20ge, Ann. AIChE meeting, Los Angeles, Ca. November, 1991

Campbell, C.S., The transition from fluid-like to solid-like behavior in granular flows, *Powders and Grains 93: 93rd International Conference on Micromechanics of Granular Media*, Birmingham, U.K., July 12th-16th, (C. Thornton ed.) 289-294, 1993.

Egolfopoulos, F.N. & Campbell, C.S., On the structure and dynamics of unsteady, counterflowing, strained diffusion flames, Fall Technical Meeting of the Western States Section/Combustion Institute, SRI International, Menlo Park, Ca. October 18-19, 1993

Campbell, C.S., Rahman, K., Hu, X. & Jin, C., Particle Pressures in Fluidized Beds, Twelfth Symposium on Energy Engineering Sciences, Argonne National Laboratory April 27-29, 1994

Potapov, A.V. & Campbell, C.S., Computer simulation of particle fracture, Proc. IFPRI Annual Meeting, Goslar Germany, Jun 12-17, 1994

Potapov, A.V. & Campbell, C.S., Computer simulation of particle breakage, Proc. Particle Technology Forum, Denver, CO., August 17-19, 1994

Campbell, C.S. & Potapov, A. V., Computer simulation of particle breakage, Proc. IFPRI Annual Meeting, Urbana IL, Jun 11-16, 1995

Campbell, C.S. & Potapov, A.V., Computer simulation of particle breakage, Proc. IFPRI Annual Meeting, Nancy France, Jun. 10-14, 1995

Campbell, C.S. & Potapov, A. V., Computer simulation of particle fracture, Second Particle Technology Forum, San Diego, CA, July 15-18, 1996

Campbell, C.S. & Potapov, A. V., Computer simulation of particle breakage, Proc. IFPRI Annual Meeting, Osaka, Japan, June, 1997

M.G. Andac, F. N. Egolfopoulos, and C.S. Campbell, A Detailed Numerical Study on the Ignition of Strained Flames by Inert Particles, by, II International Workshop on Combustion Modeling, Veracruz, Mexico, February 22-24,2001.

M.G. Andac, F. N. Egolfopoulos, and C.S. Campbell" Studies on Flame Extinction by Inert Particles in Normal- and Micro-Gravity, paper 129, The Second Joint Meeting of the US Sections of the Combustion Institute, Oakland, California, March 25-28, 200 I.

M.G. Andac, F. N. Egolfopoulos, and C.S. Campbell, A Detailed Numerical Study on the Ignition of Strained Flames by Inert Particles, paper 148, The Second Joint Meeting of the US Sections of the Combustion Institute, Oakland, California, March 25-28,2001.

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