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

PROFESSIONALINTERESTS

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 AlAA 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 A ward: "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. Egolfopolous), 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.1.) 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-F.1uidized 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 Congresso, División de Dynámica 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. 10th 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 gasfluidized 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., Egolofopolous, 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, Powder Technology, **120** (2001) 164-174

Hunt, M.L., Zenit, R., Campbell, C.S. & Brennen, C.E., Revisting 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 gasfluidized 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., Egolfopolous, 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., Egolfopolous, 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., Egolfopolous, 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 TiO₂ 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., Errodable 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: rd International Conference on Micromechanics of Granular Media, Birmingham, U.K., July 12th-16th, (C. Thornton ed.) 289-294, 1993.

Egolfopoulous, 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.

Egolfopolous, F. N., Campbell, C.S., Andac, M. G., Hot Particle Ignition of MethaneFlames, paperNo. 02S-5, Spring Technical Meeting, Western States Section/CombustionInstitute, University of California San Diego, San Diego, CA, March 25-26, 2002.

Egolfopolous, F. N., Campbell, C.S., Andac, M. G."Effects of Combustible Dust Clouds on the Extinction Behavior of Strained, Laminar, Premixed Flames in Normal-Gravity," paper No. 02S-28, Spring Technical Meeting, Western StatesSection/Combustion Institute, University of California San Diego, San Diego, CA, March 25-26, 2002.

Tolmachoff, E. D., Garcia, G., Phares, D. J., Campbell, C. S., Wang, H. "Flame synthesis of nano-phase TiO2 crystalline films," the Fifth Joint States Section of the Combustion Institute Meeting, San Diego, CA, March 25-28, 2007, paper 07-P49.

BOOK EDITED AND BOOK CHAPTERS

Advances in Micromechanics of Granular Materials -Proceedings of the Second U.S./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, 461pp.

Campbell, C.S., Computer Simulation of Powder Flows, *Powder Technology Handbook, 2nd edition,* (K. Gotoh, H. Masuda and K. Higashitani eds.) Marcell Dekker, New York, 1997,777-794

Campbell, C.S. and Potapov, A. V., Computer Simulation of Particle Breakage, *Powder Technology Handbook, 2nd edition,* (K. Gotoh, H. Masuda and K. Higashitani eds.) Marcell Dekker, New York, 1997,795-809

Granular Flow at the Elastic Limit, in Special Publication, int. Association of Sedimentology, 83-90

Grain Flow, Encyclopedia of Sediments and Sedimentary Rocks, Kluwer, Dordrecht, (2003) p. 335

Liquefaction and Fluidization, Encyclopedia of Sediments and Sedimentary Rocks, Kluwer, Dordrecht, (2003) 412

Campbell, C.S., Computer Simulation of Powder Flows, *Powder Technology Handbook, 3rd edition,* (K. Gotoh, H. Masuda and K. Higashitani eds.) Taylor and Francis, Boca Raton, 2006, New York, 737-748

ARCHIVED PLENARY LECTURESs

Campbell, C.S., Granular Flows and Gas Fluidization, International Journal of Chemical Reaction Engineering, **2** P1. http://www.bepress.com/ijcre/vol2/P1, (2004).

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