Curriculum Vitae

Mark Owkes, Ph.D.
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Positions

Assistant Professor, Mechanical Engineering — August 2014 - Present
Montana State University — Bozeman, MT

Education

Ph.D., Mechanical Engineering — August 2011 - August 2014
Cornell University — Ithaca, NY

M.S., Mechanical Engineering — August 2008 - August 2011
University of Colorado — Boulder, CO
· Focus: Energy and the Environment

B.S., Mechanical Engineering — August 2004 - May 2008
Clarkson University — Potsdam, NY
· Minor: Mathematics

Research Experience

Principle Investigator — 2014 - Present
Montana State University — Bozeman, MT
Research Projects:
· Uncertainty quantification of gas-liquid flows using polynomial chaos
· Study of electrohydrodynamic fuel atomization to improve fuel injection efficiency
· CFD simulations of Gas-liquid flow through PEM fuel cell to improve understanding and lead to improved designs. Joint project with Dr. Ryan Anderson at Chem. Bio. Engineering, Montana State University.

Graduate Research Assistant — 2011 - 2014
Cornell University — Ithaca, NY
· Advised by Dr. Olivier Desjardins
· Studied the atomization process of liquid jets including diesel injection, jets in cross-flow, and pressure-swirl atomizers
· Performed high performance computing with massively parallel simulations on billions of grid cells using thousands of computational processors
· Developed numerical schemes based on geometric algorithms to transport quantities in the presence of discontinuities
· Applied the geometric algorithms to the volume-of-fluid method to transport a phase interface with second-order accuracy and discrete conservation

Graduate Research Assistant — 2008 - 2011
University of Colorado — Boulder, CO
· Advised by Dr. Olivier Desjardins
· Improved level set interface tracking methods with the development of a discontinuous Galerkin discretization and a new interface normal calculation method
· Studied the flow through a pipe subjected to periodic translations and rotations to improve Coriolis flow meters

Undergraduate Researcher — 2007 - 2008
Honors Program, Clarkson University — Potsdam, NY
· Advised by Dr. Kenneth Visser
· Senior thesis on the feasibility of a contra-rotating vertical-axis wind-turbine-powered home-heating system
· Received first place award at AIAA Northeastern Regional Student Paper Conference

Teaching Experience

Assistant Professor 2014 - Present
Montana State University Bozeman, MT

- EMEC 303 - System Analysis. (F 2014, F/S 2015, S 2016) Revamped course content to include more numerical methods for engineers to prepare students for current and future employment opportunities
- EMEC 100 - Introduction to Mechanical Engineering (F 2015)

Instructor 2011 - 2012
Art Institute of Colorado Denver, CO

- Taught physics, robotics, and mechanical engineering courses
- Initiated a new laboratory component for the physics course with biweekly experiments
- Redesigned the robotics course to provide students a goal-oriented project-based course with students actively learning by building robots
- Practiced interactive teaching methods to motivate and engage students

Teaching Assistant for Fluid Dynamics Laboratory 2012
Cornell University, Dr. Charles Williamson Ithaca, NY

- Instructed four sections of students through fluid dynamics laboratory course
- Directed experiments, taught recitations, and graded lab reports

Teaching Assistant for Fluid Dynamics Course 2008
University of Colorado, Dr. Jean Hertzberg Boulder, CO

- Led review sessions, held office hours, and graded exams and homework assignments
- Received "Outstanding Teaching Assistant Award" - Dept. of Mechanical Engineering

Tutor 2006 - 2008
Clarkson University Potsdam, NY

- Tutored individual students in fluids, statics, dynamics, and environmental economics

Work Experience

Intern Summer and Fall 2006
GE Energy, Reliability Engineering Group Schenectady, NY

- Wrote a visual basic program to optimize wind turbine maintenance schedules
- Developed a "Lessons-Learned Database" to categorize and track failure data for integrated gasification combined cycle power plants

Intern Summer 2004 and 2005
Millennium Global Technology, Inc. Vernon, NY

- Designed and constructed prototypes at an engineering firm
- Improved design skills, practiced computer-aided-design, and learned machine shop practices

Selected Honors and Awards

- Harold C. Simmons Award, Institute for Liquid Atomization and Spray Systems, May 2014
- Research featured in "Science & Technology Review" a publication of Lawrence Livermore National Laboratory, `https://str.llnl.gov/june-2013`
- NASA Space Grant Graduate Fellowship, January 2012
- Graduate Student Service Award, March 2010 and March 2011 - Dept. of Mechanical Engineering, University of Colorado
- Outstanding Teaching Assistant Award 2009 - Dept. of Mechanical Engineering, University of Colorado
- Deans Outstanding Merit Fellowship 2008 - Clarkson University
- First place finish in AIAA Northeastern Regional Undergraduate Student Paper Competition 2008

- Phalanx Commendable Leadership Award 2008
- Robert E. Rosati '52 Award for Excellence in Mechanical Engineering 2007
- Holcroft Alumni Recognition Award 2006
- New York State Leaders of Tomorrow 2004
- James D Cartin Memorial Leadership Award 2004

Service and Outreach

Grant proposal reviewer 2015-Present
- National Science Foundation

Representative 2014 - Present
Computer Committee Montana State University, Dept. of Mech. Eng.
- Committee decides computer purchases and policy

Representative 2015 - Present
High Performance Computing Advisory Group Montana State University
- Committee advises ITC on high performance computing decisions at the university level

Journal reviewer 2013-Present
- Journal of Computational Physics
- Communications in Computational Physics
- Atomization and Sprays

Volunteer April 2015
NanoDays Montana State University
- Explored nano-scale fluid dynamics with high school students

Fluid Dynamics Program Instructor June 2013
4H Career Exploration Cornell University
- Led a group of high school students through a two-day exploration of fluid dynamics
- Designed and directed multiple experiments and demonstrations

Student Representative 2009 - 2010
Graduate Committee - Dept. of Mechanical Engineering University of Colorado
- Met biweekly with a group of 9 faculty members to address student, faculty, and departmental concerns
- Contributed significantly to the re-design of the Ph.D. Preliminary Exam process for incoming graduate students
- Participated in the process of updating the department's course requirements for graduate students

Mentor 2009 - 2010
George Reynolds Middle School Boulder, CO
- Mentored an at-risk middle-school youth weekly through Community Access Mentoring

Symposium Coordinator 2008 - 2009
Graduate Engineering Annual Research Symposium University of Colorado
- Led the student group who organized a department-wide research conference with over 20 presenters
- Coordinated industrial sponsors, visiting prospective students, catering, advertising, web-site development, and presentations

Advisor/Mentor for Student Projects

Capstone Senior Design Projects

- Human Powered Vehicle 2015
- Fuel injection System Design 2015

Students under tutelage

- Patrick Sheehy - Masters (current)
- Eric Cauble - Masters (current)
- Robert Aaron Currie - Undergraduate (current)
- Jacob Senecal - Undergraduate (current)

Refereed Journal Articles

- **Owkes**, M., Desjardins, O. (2014) "A mesh-decoupled height function method for computing interface curvature", Journal of Computational Physics, 281, 285-300.
- **Owkes**, M., Desjardins, O. (2014) "A computational framework for three-dimensional, unsplit, geometric transport with applications to the volume-of-fluid (VOF) method", Journal of Computational Physics, 270 (1) 587-612.
- Desjardins, O., McCaslin, J., **Owkes**, M., Brady, P., (2013) "Direct numerical and large-eddy simulation of primary atomization in complex geometries", Atomization and Sprays, 23 (11) 1001-1048.
- **Owkes**, M., Desjardins, O. (2013) "A discontinuous Galerkin conservative level set scheme for interface capturing in multiphase flows", Journal of Computational Physics, 249 (15) 275-302.

Conference Proceedings

- Reckinger, S. M., Reckinger, S. J., **Owkes**, M., Yenny, R. (2015) "A day in the life of a fluid dynamicist " 68th Annual Meeting of the APS DFD Gallery of Fluid Motion, Boston, MA.
- Gaillard, B., **Owkes**, M., Van Poppel, B. (2015) "High-Fidelity Simulations of Electrically-Charged Atomizing Diesel-Type Jets" 68th Annual Meeting of the APS Division of Fluid Dynamics, Boston, MA.
- Cauble, E., **Owkes**, M. (2015) "Numerical Simulations of Droplet Dynamics in PEM Fuel Cell Microchannels" 68th Annual Meeting of the APS Division of Fluid Dynamics, Boston, MA.
- Sheehy, P., **Owkes**, M. (2015) "Numerical study on influence of electric Reynolds and Peclet numbers on electrohydrodynamic assisted atomization" 68th Annual Meeting of the APS Division of Fluid Dynamics, Boston, MA.
- Sheehy, P., **Owkes**, M. (2015) "Detailed numerical study of charge mobility on electrohydrodynamic assisted atomization" 27th Annual Conference on Liquid Atomization and Spray Systems, Raleigh, NC.
- **Owkes**, M., Herrmann, M., Desjardins, O. (2014) "Accurate VoF based curvature evaluation method for low-resolution interface geometries", 66th Annual Meeting of the APS Division of Fluid Dynamics, San Fransisco, CA.
- **Owkes**, M., Desjardins, O. (2014) "Second-order and conservative numerical method for convection of variables with discontinuities", International Conference on Numerical Methods in Multiphase Flows, Darmstadt, Germany.
- **Owkes**, M., Desjardins, O. (2014) "Consistent and conservative computational framework for simulations of electrohydrodynamic atomization", 26th Annual Conference on Liquid Atomization and Spray Systems, Portland, OR.
- **Owkes**, M., Pai, M., Desjardins, O. (2014) "Large-eddy simulation study of injector geometry on liquid jet in cross-flow and validation with experiments", AIAA Science and Technology Forum and Exposition - 52nd Aerospace Sciences Meeting, National Harbor, MD.
- **Owkes**, M., Desjardins, O. (2013) "Direct numerical simulations of leaky dielectrics with application to electrohydrodynamic atomization", 65th Annual Meeting of the APS Division of Fluid Dynamics, Pittsburgh, PA.
- **Owkes**, M., Desjardins, O. (2013) "Consistent and conservative computational framework for high density ratio simulations", 25th Annual Conference on Liquid Atomization and Spray Systems, Pittsburgh, PA.

- **Owkes**, M., Desjardins, O. (2013) "Conservative, three-dimensional, unsplit, semi-Lagrangian flux scheme for volume-of-fluid methods", International Conference on Multiphase Flows, Jeju, Korea.
- **Owkes**, M., Desjardins, O. (2012) "Efficient high-fidelity simulation of pressure swirl injection", 65th Annual Meeting of the APS Division of Fluid Dynamics, San Diego, CA.
- **Owkes***, M., Desjardins, O. (2012) "Towards direct numerical simulation of a pressure swirl injector", 24th Annual Conference on Liquid Atomization and Spray Systems, San Antonio, TX.
- **Owkes***, M., Desjardins, O. (2011) "Towards direct numerical simulation of pressure swirl injectors with realistic geometries", 64th Annual Meeting of the APS Division of Fluid Dynamics, Baltimore, MD.
- **Owkes***, M., Desjardins, O. (2011) "A discontinuous Galerkin conservative level set scheme for simulating turbulent primary atomization", 23rd Annual Conference on Liquid Atomization and Spray Systems, Ventura, CA.
- **Owkes***, M., Desjardins, O. (2011) "Experimental and numerical investigation of air-blast n-dodecane injection", 49th AIAA Aerospace Sciences Meeting, Orlando, FL.
- **Owkes***, M., Desjardins, O. (2010) "A quadrature-free discontinuous Galerkin conservative level set method", 63rd Annual Meeting of the APS Division of Fluid Dynamics, Long Beach, CA.
- **Owkes***, M., Desjardins, O. (2010) "Quadrature-free discontinuous Galerkin level set scheme", 22nd Annual Conference on Liquid Atomization and Spray Systems, Cincinnati, OH.
- **Owkes***, M., Desjardins, O. (2009) "Direct numerical simulation of turbulent pipe flows subjected to transverse oscillations", 62nd Annual Meeting of the APS Division of Fluid Dynamics, Minneapolis, MN.
- **Owkes***, M., Visser, K. (2009) "Feasibility of a Unique Wind Powered Home Heating System", 47th AIAA Aerospace Sciences Meeting, Orlando, FL.
- **Owkes***, M., Visser, K. (2008) "Feasibility of a Unique Wind Powered Home Heating System", AIAA Northeastern Regional Student Conference, Potsdam, NY.

* Published under maiden name Czajkowski

Invited Seminars and Lectures

- Owkes, M., (2014) "The study of liquid sprays for combustion applications using supercomputers", Applied Math Department, Montana State University, Bozeman, MT
- Owkes, M., Capecalatro, J. (2014) "Using supercomputers to study biofuel production and injection", West Point Military Academy, West Point, NY
- Owkes, M. (2014) "The study of liquid spray for combustion applications using supercomputers", Colorado School of Mines, Golden, CO
- Owkes, M. (2014) "The study of liquid spray for combustion applications using supercomputers", Michigan Technological University, Houghton, MI
- Owkes, M. (2014) "The study of liquid spray for combustion applications using supercomputers", Montana State University, Bozeman, MT
- Owkes, M. (2011) "A novel numerical method for interface capturing in multiphase flows", Computational Fluids and Energy Systems, University of Colorado, Boulder, CO

Professional and Honor Societies

- American Physical Society (APS)
- American Institute of Aeronautics and Astronautics (AIAA)
- Institute for Liquid Atomization and Spray Systems (ILASS)
- American Society of Mechanical Engineers (ASME)

- Phalanx - Clarkson University's Highest Honorary society
- Tau Beta Pi - Engineering Honor Society
- Phi Kappa Phi - Honor Society

Extra-Curricular Activities

Team Leader 2007 - 2008
Human-Powered Vehicle Clarkson University

- Led a team of eleven senior mechanical engineers in the design and construction of a fully-enclosed recumbent bicycle
- Competed in the 2008 ASME human-powered vehicle competition in Wisconsin

Suspension Sub-team Leader 2004 - 2007
Mini-Baja Clarkson University

- Participated in a team that engineered and built an off-road vehicle
- Directed a group of five students with the design and fabrication of the suspension system
- Competed in the SAE Mini-Baja events and earned 2nd place out of 66 teams in 2006