

## CURRICULUM VITAE

Cecilia D. Richards

Professor

School of Mechanical and Materials Engineering  
Washington State University  
Pullman, WA 99164-2920

**EDUCATION:** Ph. D., Mechanical Engineering, 1990  
University of California  
Irvine, CA

M.A.Sc., Mechanical Engineering, 1985  
B.A.Sc., Mechanical Engineering, 1981  
B.S., Mathematics, 1977  
University of British Columbia,  
Vancouver, Canada

**HONORS:** National Science Foundation Young Investigator, 1994 - 1999  
  
National Research Council Postdoctoral Fellowship, 1990  
  
University of California Dissertation Fellowship, 1989/90  
  
G.P.O.P. Fellowship, University of California, 1986 - 1989

**AWARDS:** ASME Best Paper Award MEMS Division, 2005  
  
Research Excellence in Mechanical & Materials Engineering, WSU 2003  
  
Marshall Best Paper Award for the most significant contribution to the 9th Annual Conference of ILASS, May 1996, San Francisco, CA.  
  
AIAA/Gordon C. Oates Air Breathing Propulsion (Graduate) Award, 1989

## PROFESSIONAL EXPERIENCE:

1/09 – 8/09 *Visiting Professor*, Pontifica Universidad Catolica de Chile, Department of Mechanical Engineering, Santiago, Chile

8/05 – present *Professor*  
8/98 – 7/05, *Associate Professor*,  
8/92 – 8/98, *Assistant Professor*, Dept. Mechanical and Materials Engineering, Washington State University, Pullman, WA

10/90 - 8/92 *N.R.C. Postdoctoral Associate*,  
Center for Fire Research, National Institute of Standards and Technology,  
Gaithersburg, MD

6/85 - 8/86, *Research Engineer*, ITT Barton Instruments,  
City of Industry, CA.

6/81 - 9/83, *Engineer*, H.A. Simons (International) Ltd.,  
Vancouver, B.C.

**PROFESSIONAL  
MEMBERSHIPS:**

ASME, AIAA, SAE, ILASS, Combustion Institute

**SERVICE:**

**Professional**

Program Review Committee, 25<sup>th</sup> Symposium (International) on Combustion  
Program Review Committee, 26<sup>th</sup> Symposium (International) on Combustion  
Program Review Committee, 27<sup>th</sup> Symposium (International) on Combustion  
Program Review Committee, 28<sup>th</sup> Symposium (International) on Combustion  
Program Review Committee, 29<sup>th</sup> Symposium (International) on Combustion  
Program Review Committee, 30<sup>th</sup> Symposium (International) on Combustion  
Program Review Committee, 31<sup>th</sup> Symposium (International) on Combustion  
Reviewer, ASME National Heat Transfer Conference, 1993  
Reviewer, ASME Winter Annual Meeting, 1996  
Reviewer, International Mechanical Engineering Congress & Exposition, 1998  
Reviewer, ASME IGTI, 1992.  
Reviewer, National Science Foundation 1995 - 2006  
Panelist, National Science Foundation, 1995, 1998, 2003, 2004, 2005, 2006  
Reviewer, US CRDF  
Reviewer, AIAA Progress Series  
Reviewer, ASME Journal of Fluids Engineering  
Reviewer, Petroleum Research Fund  
Reviewer, AIAA Propellants & Combustion Tech. Committee.  
Reviewer, Journal of Fluid Mechanics  
Reviewer, Physics of Fluids  
Reviewer, Journal of Laser Applications  
Reviewer, Atomization & Sprays  
Reviewer, Experiments in Fluids  
Reviewer Applied Physics Letters  
Reviewer Journal of Micromechanics and Microengineering  
Reviewer Journal of Applied Physics  
Reviewer Applied Energy

**University**

Chair Laboratory and Equipment Committee 2012

Member Faculty Search Committee 2012  
Chair Faculty Search Committee 2011  
Chair Safety Committee 2010  
Chair Faculty Search Committee 2010  
Chair Faculty Search Committee 2009  
Member MME Undergraduate Studies Committee  
Chair MME Graduate Studies Committee 2003 – 2008  
Member, Foundation Faculty Advisory Council 2003 – 2006  
Member COEA Dean Search Committee 2004 -2005  
Chair MME Faculty Search Committee 2005/06  
Reviewer Faculty Seed Grant 2006, 2007, 2009  
Reviewer Regents Scholar Applicants 2005, 2006,2007,2009  
Member, COEA Dean Review Committee, 2003  
Member Strategic Planning Implementation Team, 2002 - 2005  
Member SPFO Search Committee 2001, 2002  
Member MME Graduate Studies Committee 2002 – 2003  
Member MME Laboratory Equipment Committee 2003 – present  
Member MME Safety Committee 2001-2002  
Member MME Manufacturing Search Committee 2001  
Chair MME Director Search Committee 1999-2000  
Chair, COEA 120 Committee 2000  
Member Internal Advisory Group 1999-2000  
Member Distinguished Lecturer Series Committee (college), 1993 - 1995  
Member MME Undergraduate Studies Committee 1993 - 2000  
Member COEA Dean Search Committee, 1995  
Member MME Faculty Search Committee , 1996/97  
Member College Honors Committee 1996 - 1997  
Member COEA Quality Focus Group 1995 - 1996  
Member COEA Design Focus Group 1995 - 1996  
Co-ordinator, Merit Program (school) 1995 – 2000  
Co-ordinator, Engr 120, 1998 – 2001  
Alive Advisor 1997, 1998, 1999  
Instructor/Mentor Summer Camp for Native American Students 1999  
Instructor, Korean Exchange Program, 2000  
SAE Faculty Advisor (college), 1993 – 1998, 2005 - 2008  
Robotics Club Advisor (college), 1994 - 1999  
Academic Advisor for Honors Program Undergraduates 1993-present  
SWE Advisor 2002 – 2004  
Reviewer for summer doctoral fellowships, 1994

## **RESEARCH GRANTS:**

NSF – *Research Experience for Undergraduates: Introduction to Multiscale Engineering*, PI, \$300,000 5/12 – 5/15

Infinia Corp - *Coupled Free-Piston Stirling Engine (FPSE), Stirling Cooler, and Absorption Chiller (FROST) for Tactical Deployed Air Conditioning of Electronic Load*, PI, \$30,000 4/10 – 9/10

NSF – *Research Experience for Undergraduates: Introduction to Multiscale Engineering*, PI, \$300,000 5/08 – 5/11

NIH - *Implantable 16-256 Channel Data System for sleep in Mice.*, Co-PI , 1,200,000, 1/06 – 1/10

NSF – *Nanotube based structures for high resolution control of thermal transport*, PI, \$1,000,000 8/04 – 7/09

TPL SBIR:DARPA – *Integrating the P3 Microengine with TPL Inc.'s Supercapacitor Technologies*, Co-PI \$190,000

Isothermal Systems Research - *Characterization of Spray Cooling Nozzles*, PI, \$25,000, 1/04 – 12/04.

TPL STTR:Navy – *Piezoelectrics for energy harvesting*, Co-PI\$30,000 6/04 - 12/04

M.J. Murdock Charitable Trust - *A Fabrication Facility for MEMS Devices Based on Novel Materials*, Co-PI , \$401,574

Lockheed Martin Aeronautics - *The P3 Power Generation System for Converting Kinetic to Electrical Energy.*, Co-PI, \$50,000, 05/16/03- 05/15/04

US ARMY SMDC - *The P<sup>3</sup> Power Generation System for Advanced Missile Defense Applications*, Co-PI , \$2,400,000 1/03 – 1/08

DARPA/MTO – *The P3 Micro Power Generator*, Co-PI, \$1,400,000 10/01 – 12/05

NSF- *MEMS Based Power Generation for Portable Systems*, Co-PI, NSF:XYZ on a Chip Grant, \$520,000 1999.

NSF- *Measurement & Analysis of Homogeneous Carrier-Phase Turbulence in Fluid-Particle Flows*, Co-PI, \$104,000 1/00 – 12/00

NSF- *NSF Young Investigator*, PI, \$335,000, 8/94 – 3/01

Watkins Johnson – *Acquisition of Instructional Robots*, PI, \$58,608, 1998.

ARCO – *Acoustic Enhancement of a Coke Calciner*, PI, \$10,000, 1998

Tektronics – *Acquisition of a Color Printer*, \$9337, 1997.

Hewlett Packard- *Acquisition of an HP Workstation*, \$31,000, 1996.

Isothermal Systems Research - *Testing of Spray Quenching Nozzles*, PI, \$12,000, 10/96 - 6/97

Isothermal Systems Research - *Characterization of Spray Cooling Modules*, PI, \$4,800, 2/95 - 9/95.

Flow International Corporation- *Cleaning of Surfaces with Water Jet Technology*, \$15,000, 1995.

Hewlett Packard- *Acquisition of an HP Workstation*, \$35,000, 1995.

NSF- *Droplet Dispersion by Large Scale Structures in Axisymmetric Jets*, PI, \$90,000, 6/93 - 6/96.

NSF- *Research Experience for Undergraduates*, PI, \$39,000, 5/94 - 12/96.

NSF - *Acquisition of a Nd:YAG Laser*, PI  
Research Equipment Award, \$27,500, 7/94.

Battelle PNNL- *Velocity Field in a Pseudoplastic Jet*, PI, \$18,000 1994.

WSU *Vortical Structures in Pool Fires*, PI on Grant in Aid Research Award, \$13,000, 7/93-7/94.

**RESEARCH  
SUPERVISED:**

**MS**

Srinath S. Chakravarty, Sean Hai Hu, Tait Swanson, Gerald Doulliard, Terry Johnson, Karuki Eichman, Chris Wark, Jeff Hall, Kevin Bruce, Nathan Stoddard, Michael Thompson, James Raupp, Owen Crabtree, Jeong Cho, Robert Gifford, Atsushi Sumiya, Brian Hollenberg, Kirsten McNeil, Andy Wekin, Annie Chawla, Gwen Eliss

**PhD**

Cheng Gang Xu, Jeong Cho, Hamzeh Bardaweel, Amer Hamden, Judith Bamberger, Preetham Burugupally, Ahmed Najji

**Post Doctoral**

Omar Alhattemhah, Ismail Demir,  
Yiming Yang, Jian Ye

**COURSES  
TAUGHT:**

ME 509	MEMS Engineering
ME 561	Combustion Theory (Graduate)
ME 598	Graduate Seminar (Graduate)
ME 526	Statistical Thermodynamics (Graduate)
ME 406	Thermal Systems Laboratory (Undergraduate)

ME 402	Thermal Design
ME 436	Combustion Engines (Undergraduate)
ME 435	Thermal Systems (Undergraduate)
ME 499	Independent Study
UH 450	Honors Thesis
ME 305	Thermal Fluids Laboratory
ME 120	Intro to Engineering (Undergraduate)
ME 125	Merit (Undergraduate)
UH 390	Global Issues in the Sciences

## PATENTS

### **Piezoelectric Micro-Transducers, Methods of Use and Manufacturing Methods for Same**

Robert Richards, David Bahr, Cecilia Richards

US #7,235,914 issued

Australia # 2001297790 issued

### **Thermal Switch for Use in Piezoelectric Micro Heat Engines**

Robert Richards, David Bahr, Cecilia Richards

US # 10/535,315

## PUBLICATIONS

H. Lee, C.D. Richards, R.F. Richards, "Experimental and Numerical Study of Microchannel Heater/Evaporators for Thermal Phase-Change Actuators", *Sensors and Actuators A*, DOI 10.1016/j.sna.2013.02.004, 2013

B. S. Preetham, M. Anderson, C. Richards, *Modeling of a resonant heat engine*, Accepted *J of Appl Phys*, 112, 124903, 2012

H. Bardaweel, M. Anderson, R. Richards, C. Richards, *Characterization of the thermodynamic cycle of a MEMS-based external combustion resonant engine*, *Microsyst Tech*, Vol 18, 693, 2012.

A Hamdan, F Sahli, R Richards and C Richards *Characterization of a dielectric microdroplet thermal interface material with dispersed nanoparticles*, *Journal of Nanoparticle Research*, Vol. 14, 1111, 2012.

L. Weiss, C Richards and R Richards, *Power Output and Force Generation by a MEMS Phase Change Actuator*, *JMEMS* , Vol. 20, 1287, 2011.

A.R. McLanahan, C. Richards, R. Richards, "A Dielectric Liquid Contact Thermal Switch with Electrowetting Actuation," *Journal of Micromechanics and Microengineering*, 21, 104009, 2011

A Hamdan, R Richards and C Richards, *Characterization of a liquid-metal microdroplets thermal interface material*, *Experimental and Thermal Fluid Science*, Vol. 35 #7, 1250-1254, 2011.

- H. Bardaweel, B. S. Preetham, M. Anderson, R. Richards, C. Richards *MEMS-based resonant heat engine: Scaling analysis*, Microsyst Tech, Vol 17, 1251 -1261, 2011.
- H. Bardaweel, M. Anderson, R. Richards, C. Richards, *Cyclic operation of a MEMS based resonant heat engine: Model and Experiment*, J Appl Phys 107, 10491, 2010.
- A Hamdan, J Cho, R Johnson, D Bahr, J Jiao, R Richards and C Richards  
*Evaluation of a thermal interface material fabricated using thermocompression bonding of carbon nanotube turf*, Nanotechnology, Vol. 21, 015702, 2010
- R D Johnson, D F Bahr, C D Richards, R F Richards, D McClain, J Green and J Jiao  
*Thermocompression bonding of vertically aligned carbon nanotube turfs to metalized substrates*, Nanotechnology, Vol. 20, 065703, 2009.
- H. Bardaweel, M. Anderson, R. Richards, C. Richards, *"Optimization of the dynamic and thermal performance of a resonant micro heat engine"* Journal of Micromechanics and Microengineering, Vol. 18, 104014, 2008.
- J. Cho, C. Richards, D. Bahr, J. Jiao, and R. Richards, *"Evaluation of contacts for a MEMS thermal switch"* Journal of Micromechanics and Microengineering, Vol. 18, 105012, 2008.
- H. Bardaweel, M. Anderson, R. Richards, C. Richards, *"Characterization and modelling of the dynamic behavior of a liquid-vapor phase change actuator"* Sensors and Actuators, A. Physical, 149, No. 2, 284-291, 2008.
- Taejin Kim, Mohamed Osman, Cecilia Richards, Robert Richards and David Bahr *"Molecular Dynamics Simulations of the Thermal Interface Resistance between Silicon and Single Wall Carbon Nanotubes"* Physical Review B, in review.
- Cho J., C.Lin, C.D.Richards, R.F.Richards, J. .Ahn, P.D.Ronney, *"Demonstration of an external combustion microheat engine"* Symposium International on Combustion, Vol. 32, No. 2, 3099 – 3105, 2008.
- D. McClain, J. Wu, N. Taven, J. Jiao, C. McCarter, C. Richards, R. Richards, D. Bahr *"Electrostatic shielding in patterned Carbon Nanotube Arrays,"* Journal Physical Chemistry C, Vol. 7, p, 2007.
- Jeong-Hyun Cho, Cecilia Richards, and Robert Richards, *"A facility for characterizing the steady-state and dynamic thermal performance of MEMS thermal switches,"* Review of Scientific Instruments, Vol. 79, 034091, 2008.
- M. Anderson, C. Richards, R. Richards, D. Bahr, *Lumped parameter analysis of an enclosed incompressible squeeze film and central gas bubble*, J. Of Fluids Eng., Vol. 130, No. 2, 021303, 2008.
- J. Cho, L. Weiss, C. Richards, D. Bahr and R. Richards, *Power production by a dynamic heat engine with an integrated thermal switch*, Journal of Micromechanics and Microengineering, Vol. 17, p 217 - 223, 2007.

Taejin Kim, Mohamed Osman, Cecilia Richards, Robert Richards and David Bahr, “*Molecular Dynamics of Heat Pulse Propagation in Multiwall Carbon nanotubes.*” *Physical Review B*, Vol. 76, 155424 (2007).

Keisuke Horiuchi, Prashanta Dutta, Cecilia Richards, *Experiments and simulations of mixed flows in a trapezoidal microchannel*, *Microfluidics and Nanofluidics*, Vol.3, pp. 347-358 (2007).

J.H. Cho, R. F. Richards, D.F. Bahr, C.D. Richards, *Development of noncontact spring constant measurement and deflection characterization of piezoelectric devices*, *J. Applied Phys.*, Vol 101, 044104 (2007).

C. M. McCarter, S.Dj. Mesarovic, , D.F. Bahr, R.F. Richards, C.D. Richards, D. McClain, J. Jiao, *Mechanical compliance of photolithographically defined vertically aligned carbon nanotube turf*, *J. Journal of Materials Science*, vol. 41, pp. 7872-7878 (2006)

S.A. Whalen, C. Richards, D. F. Bahr, and R. Richards, *Characterization of a Liquid-Vapor Phase-Change Actuator with Microcapillary Wick*, *Sensors and Actuators, A. Physical*, 134 (2007) 201-212

S.Dj. Mesarovic, C. M. McCarter, D.F. Bahr, H. Radhakrishnan, R.R. Richards, C.D. Richards, D. McClain, J. Jiao, *Mechanical Behavior of a carbon nanotube turf*, *Scripta Materialia* Vol. 56 p 157 (2007).

J. Cho, T. Wiser, C. Richards, D. Bahr and R. Richards, *Fabrication and Characterization of a Thermal Switch*, *Sensors and Actuators*, Vol 133, p 55 - 63, 2007.

L.W. Weiss, J. Cho, K.E. McNeil, D.F. Bahr, C.D. Richards, and R.F. Richards, *Characterization of an External Combustion Dynamic Micro Heat Engine*, *Journal of Micromechanics and Microengineering*, Vol. 16, p 1-8, 2006.

J.H. Cho, M.J. Anderson, R. F. Richards, D.F. Bahr, C.D. Richards, *Efficiency of energy conversion by piezoelectrics*, *Applied Phys Letters*, Vol 89, p 104, 2006

M.C. Robinson, D.J.Morris, P.D. Hayenga, J.H. Cho, C.D. Richards, R.F. Richards, and D.F. Bahr, "*Development of noncontact spring constant measurement and deflection characterization of piezoelectric devices*, *Applied Physics A*, Vol. 85, p 135, 2006.

O. Al-Hattamleh, J. Cho, R. Richards, D. Bahr, C. Richards, *The effect of design and process parameters on electromechanical coupling for a thin-film PZT membrane*, *JMEMS*, 15,(6), p 1715, 2006

B. A. Hollenberg, C. D. Richards, R.F. Richards, D.F. Bahr, and D.M. Rector, *Fabrication of a Flexible MEMS Electrode Array for Recording Surface Field Potentials*, *J. Neuroscience Methods* Vol 153, Issue 1, p. 147-153 (2006)

O. I. Crabtree, S. Dj. Mesarovic, R. F. Richards, D. F. Bahr, C. D. Richards, *Nonlinear Vibrations of a Pre-Stressed Laminated Thin Plate*, *International J of Mech. Sciences*, Vol 48, No. 4, 451 – 459 (2006).

- D. McClain, L.F. Dong, C.C. Pan, J. Jiao, C. McCarter, D. Bahr, C. Richards, R. Richards, "Synthesis and Microanalysis of Aligned Carbon Nanotube Arrays," Proceedings of Microscopy and Microanalysis 2005, Vol. 11, Supplement 2, 1920-1921 (2005).
- J. Cho, M. Anderson, R. Richards, D. Bahr, C. Richards, *Optimization of Electromechanical Coupling for a Thin Film PZT Membrane. Part I: Modeling*, Journal of Micromechanics and Microengineering, Vol. 15 pp.1797-1803, (2005)
- J. Cho, M. Anderson, R. Richards, D. Bahr, C. Richards, *Optimization of Electromechanical Coupling for a Thin Film PZT Membrane. Part II: Experiment*, Journal of Micromechanics and Microengineering, Vol. 15 pp. 1804-1809, (2005)
- C. D. Richards, M. A. Anderson, D. F. Bahr, and R. F. Richards, *Efficiency of energy conversion for devices containing a piezoelectric component*, Journal of Micromechanics and Microengineering, Vol. 14, no. 5, 717 – 721 (2004).
- I. Demir, A.L. Olson, J. L. Skinner, C. D. Richards, R. F. Richards, D. F. Bahr, *High Strain Behavior of composite thin film piezoelectric membranes*, J. Microelectronics Engineering, Vol. 75,12 – 23, (2004) .
- L.M.R. Eakins, B.W. Olson, C.D. Richards, R.F. Richards, and D.F. Bahr, *Influence of structure and chemistry on piezoelectric properties of PZT in a MEMS power generation application*, J. Mater. Res., vol. 18, pp. 2079-2086(2003).
- L.M.R. Eakins, B.W. Olson, C.D. Richards, R.F. Richards, D.F. Bahr, *Microstructural Characterization And Mechanical Reliability Of Pt/Pzt Interfaces In MEMS Applications*, Thin Solid Films, vol. 441, pp. 180-186 (2003).
- S. Whalen, M. Thompson, D. Bahr, C. Richards and R. Richards, *Design, Fabrication and Testing of the P3 Micro Heat Engine*, Sensors and Actuators, vol. 104, no.3, pp. 200-208, (2003).
- J. D. Hall, N. E. Apperson, B. T. Crozier, C. Xu, R. F. Richards, D. F. Bahr, and C. D. Richards, "A facility for characterizing the dynamic mechanical behavior of thin film membranes for microelectromechanical systems devices", Review of Scientific Instruments, Vol. 73, pp. 2067-2072, 2002.
- D.F. Bahr, B.T. Crozier, C.D. Richards, and R.F. Richards, "Fatigue and Fracture in Membranes for MEMS Power Generation", Mechanical Properties of Structural Films, STP No. 1413, C.L. Muhlstein and S.B. Brown, Eds., American Society for Testing and Materials, West Conshohocken, PA, (2001).
- Wark, C., Eickmann, K., and Richards, C., "The Structure of an Acoustically Forced Reacting Two Phase Jet," Combustion and Flame, Vol. 120, No. 4, pp 93-102, 2000.
- Richards, C.D. and Richards, R.F., "Transient Temperature Measurements in a Convectively Cooled Droplet," Experiments in Fluids, Vol. 25, p. 392 (1998).

Richards, C.D., and Richards, R.F., "Convective cooling of a suspended water droplet," ASME J. Heat Trans., Vol. 119, no. 2 (1997).

Swanson, T.R. and Richards, C.D., "The Structure of a Droplet-Laden Acoustically-Forced Jet," Atomization and Sprays, Vol. 7, pp. 561 - 579, 1997.

Ye, J. and Richards, C.D., "Droplet and Vapor Transport in a Turbulent Jet," 26<sup>th</sup> Symposium (International) on Combustion, pp. 1679 -1686, 1996.

Richards, C. D., Bruel, B.D., Clark, R.P., and Troutt, T.R., "Concentration Measurements in a Self-Excited Jet," Experiments in Fluids, Vol. 21, pp 103 - 109, 1996.

Shekarriz, A., Douillard, G.D., Weir, T., and Richards, C.D., "Velocity Measurements in a Turbulent Non-Newtonian Jet," ASME Journal of Fluids Engineering, Vol. 118, pp. 872, 1996.

Richards, C. D. and Pitts, W. M., "Global Density Effects on the Self-Preservation Behavior of Turbulent Free Jets," J. Fluid Mechanics, 254, Sept. 1993.

Bryner, N., Richards, C. D., and Pitts, W. M., "A Rayleigh Light Scattering Facility for the Investigation of Free Jets and Plumes," Rev. Sci. Instrum., Vol 63, No. 7, July, 1992.

Richards, C. D. and Samuelsen, G. S., "The Role of Primary Jets in the Dome Region Aerodynamics of a Model Can Combustor," ASME Journal of Engineering for Gas Turbines and Power, Vol. 114, No. 1, Jan. 1992.

Richards, C. D. and Samuelsen, G. S., "The Role of Primary Jet Injection on Mixing in a Gas Turbine Combustor," the Proceedings of the 23<sup>rd</sup> Symposium (International) on Combustion, The Combustion Institute, 1990.

McDonell, V. G., Cameron, C. D., and Samuelsen, G. S., "Symmetry Assessment of Air-Blast Atomizers," AIAA Journal of Propulsion and Power, Vol. 6, No. 4, July-August 1990.

Cameron, C. D., Brouwer, J., and Samuelsen, G. S., "A Model Gas Turbine Combustor with Wall Jets and Optical Access for Turbulent Mixing, Fuel Effects, and Spray Studies," the Proceedings of the 22<sup>nd</sup> Symposium (International) on Combustion, The Combustion Institute, 1988.

Cameron, C. D., Brouwer, J., Wood, C. P., and Samuelsen, G. S., "A Detailed Characterization of the Velocity and Thermal Fields in a Model Can Combustor with Wall Jet Injection," ASME Journal of Engineering for Gas Turbines and Power, Vol. 111, pp. 31, 1989.

### Reports

Pitts, W.M., Richards, C.D., and Levenson, M. S., "Large and Small-Scale Structures and Their Interactions in an Axisymmetric Jet," NISTIR 6393, Gaithersburg, MD, October 1999.

### Books

Richards, Cill, "Introduction to Engineering," McGraw-Hill , Primus Custom Publishing, 1999.

## CONFERENCE PROCEEDINGS

### Refereed

H Bardaweel, M Anderson, R Richards, and C Richards, *On the thermodynamic cycle of a MEMS-based external combustion resonant engine*, Proceedings of the 10th International Workshop on Micro and Nanotechnology for Power Generation and Energy Conversion Applications, Lueven Belgium, Dec 1 -4, 2010.

H Bardaweel, B.S. Preetham, M. Brubake, M Anderson, R Richards, and C Richards *Scaling Analysis of a MEMS based resonant micro heat engine*, Proceedings of the 10th International Workshop on Micro and Nanotechnology for Power Generation and Energy Conversion Applications, Lueven Belgium, Dec 1 -4, 2010.

A McInanahan, R Richards, and C Richards, *A Liquid Contact Thermal Switch with Electrowetting Actuation*, Proceedings of the 10th International Workshop on Micro and Nanotechnology for Power Generation and Energy Conversion Applications, Lueven Belgium, Dec 1 -4, 2010.

H Bardaweel, M Anderson, R Richards, and C Richards, *A resonant Air Standard Heat Engine*, Proceedings of ASME IMECE2010-39190, Vancouver, Canada, 2010.

H Bardaweel, B S Preetham, M Anderson, R Richards, and C Richards, *Development of a Scaling Model for a MEMS Based Micro Heat Engine*, Proceedings of ASME IMECE2010-37946, Vancouver, Canada, 2010.

A Hamdan, A McClanahan, R Richards, and C Richards, *Characterization of a liquid-metal microdroplets thermal interface material*, Proceedings of ASME IMECE2010-39609, Vancouver, Canada, 2010.

H Bardaweel, M Anderson, R Richards, and C Richards, *Thermodynamic cycle of a MEMS-based external combustion resonant engine*, Proceedings of ASME IMECE2010-37945, Vancouver, Canada, 2010.

A McInanahan, R Richards, and C Richards, *A Liquid Contact Thermal Switch with Electrowetting Actuation*, Proceedings of ASME IMECE2010-39269, Vancouver, Canada, 2010.

M. Yanez, E. Gramsch, R. Santander, C. Richards, R. Richards, *Developing Microfabrication Capabilities across the Americas: A Chilean – US Study*, 2010 ASEE Annual Conference, Louisville, Kentucky, June 20-23, 2010.

H Lee, C Richards, and R Richards, *Active Thermal Control for Power MEMS*, Proceedings of the 9th International Workshop on Micro and Nanotechnology for Power Generation and Energy Conversion Applications, Washington DC, USA, Dec. 1-4, 2009.

H Bardaweel, M Anderson, R Richards, and C Richards, *Thermodynamic Characterization and Scaling of a MEMS Heat Engine*, Proceedings of the 9th International Workshop on Micro and

Nanotechnology for Power Generation and Energy Conversion Applications, Washington DC, USA, Dec. 1-4, 2009.

H Bardaweel, M Anderson, R Richards, and C Richards, *Resonant versus sub resonant operation of a mems heat engine*, ASME IMECE2009-10897, Orlando, Florida November 16- 19, 2009.

Amer Hamdan, Jeong Cho, Ryan Johnson, David Bahr, Robert Richards, Cecilia Richards, Jun Jiao, " *Evaluation of a thermal interface materials using thermocompression bonding of carbon nanotube turf*," ASME IMECE2009-10990, Orlando, Florida November 16- 19, 2009.

K. Matveev, N. Shafiei-Tehrany, C.D. Richards, " *Small-Scale Thermoacoustic Engine Demonstrator*" Proceedings of 8th International Workshop on Micro and Nanotechnology for Power Generation and Energy Conversion Applications, Sendai Japan, November 9 – 12, 2008.

K. Matveev, N. Shafiei-Tehrany, C.D. Richards, " *Small-Scale Thermoacoustic Engine Demonstrator*" ASME IMECE 2008, Boston, November 5 -12, 2008.

J. Cho, C. Lin, C.D. Richards, .F. Richards, J. Ahn " *Demonstration of an External Combustion Micro-Heat Engine*" Proceedings of the 8<sup>th</sup> International Workshop on Micro and Nanotechnology for Power Generation and Energy Conversion Applications, Sendai Japan, November 9 -12, 2008.

Cho J., C.Lin, C.D.Richards, R.F.Richards, J. .Ahn " *Demonstration of an external combustion microheat engine*" ASME IMECE 2008, Boston, November 5 -12, 2008.

Radhkrishnan H., S. .Mesarovic, D. .Bahr, C.McCarter, C.D.Richards, R.F. Richards " *A Phenomenological Model For A Carbon Nanotube Turf*" ASME IMECE 2008, Boston, November 5 -12, 2008.

H. Bardaweel, Anderson M., R.F.Richards, C.D.Richards " *Characterization of a resonant MEMS heat engine*" ASME IMECE 2008, Boston, November 5 -12, 2008.

H. Bardaweel, Anderson M., R.F.Richards, C.D.Richards " *Working cycle of a resonant heat engine*" Proceedings of the 8<sup>th</sup> International Workshop on Micro and Nanotechnology for Power Generation and Energy Conversion Applications, Sendai Japan, November 9 -12, 2008.

H-K, Lee, C.D. Richards, R.F. Richards, " *Numerical and experimental study of evaporative heat transfer from a radial microchannel evaporator for an external combustion micro heat engine*" ASME IMECE 2008, Boston, November 5 -12, 2008.

Osman M.A., T.kim, C.D.Richards, R.F.Richards, D. .Bahr " *Thermal Interface Resistance at Carbon nanotube and Silicon Interface*" ICN08 Abstracts, International Conference on Nanotechnology: Opportunity and Challenges, Jeddah Saudi Arabia, June 17 -19, 2008.

Osman M.A., T.kim, C.D.Richards, R.F.Richards, D. .Bahr " *Thermal Interface Resistance between Carbon Nanotubes and Silicon*" 2008 Symposium PNW AVS, Richland WA, Sept 18-19, 2008.

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