

# CYRUS K. MADNIA

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## **1. EDUCATION:**

Ph.D. Aerospace Engineering. The University of Michigan, Ann Arbor, MI, May 1989.

M.S.E. Aerospace Engineering. The University of Michigan, August 1982.

B.S.E. (*Magna Cum Laude*). Aerospace Engineering. The University of Michigan, August 1980

## **2. EMPLOYMENT HISTORY:**

Professor, Department of Mechanical and Aerospace Engineering (MAE), University at Buffalo (UB), State University of New York (SUNY), September 2006-present.

Associate Professor, MAE at UB, September 1999 - August 2006.

Assistant Professor, MAE at UB, September 1994 - August 1999.

Research Assistant Professor, MAE at UB, September 1992 - August 1994.

Postdoctoral Research Associate, MAE at UB, October 1989 - August 1992.

Visiting Scientist, Theoretical Flow Physics Branch, NASA Langley Research Center, Hampton, Virginia, June-August 1990.

## **3. AWARDS AND RECOGNITIONS:**

Research profile featured as “U.B. Professor Helping NASA Launch it’s Future,” WKBW TV in Buffalo, NY on 4/21/2010. Web page: <http://www.wkbw.com/news/local/91766164.html>.

Interviewed by WIVB TV of Buffalo, NY, about the plane crash in Hudson River, 15 January, 2009. Web page: [http://www.wivb.com/dpp/news/local\\_passengers\\_react\\_to\\_plane\\_crash\\_090115](http://www.wivb.com/dpp/news/local_passengers_react_to_plane_crash_090115).

American Institute of Aeronautics and Astronautics (AIAA) Associate Fellow, 2008.

Research profile featured as “Flame-wall interactions illuminated on TeraGrid,” TeraGrid Web page (<http://www.teragrid.org/news/news06/madnia.html>), 2006.

Research profile featured as “NCSA users illuminate flame-wall interactions,” NCSA Web page (<http://access.ncsa.uiuc.edu/Stories/nuggets/madnia.html>), Oct. 3, 2006.

Research profile featured as “Where are they now?,” National Center for Supercomputing Applications (NCSA) Web page (<http://access.ncsa.uiuc.edu/Stories/WhereNow/summer06.html>), December 12, 2006.

SUNY Chancellor’s Award for Excellence in Teaching, 2002.

Research profile featured as “Most Accurate Model of Turbulent Reacting Flows Produced,” in *SEAS UB News* (Publication of UB), Vol. VIII, Number I, 2002.

Profile featured as “13 Receive SUNY Chancellor’s Award” in *Reporter* (Publication of UB), Vol. 34, No. 1, August 29, 2002.

Research profile featured as “Novel Simulations of Turbulent Reacting Flows Provide Insight Into Physics of Internal Combustion,” UB’s National News Web page (<http://www.buffalo.edu/news>), January 9, 2002.

Research profile featured as “Access News Brief” on the National Center for Supercomputing Applications (NCSA) Web page (<http://access.ncsa.uiuc.edu/Briefs/020115.JFM.html>), January 15, 2002.

CAREER Award, National Science Foundation (1996-2001).

Research profile featured as “Science Success Spotlight,” on the National Center for Supercomputing Applications (NCSA) Web page ([www.ncsa.uiuc.edu/News/Access/Stories/flame](http://www.ncsa.uiuc.edu/News/Access/Stories/flame)), August 2001.

Research profile featured in *ACCESS* (Publication of NSF supported NCSA), Vol. 14, No. 2, Summer 2001.

Featured in the Honor Roll, *Buffalo News*, October 27, 1996.

Paper entitled “Structure of a Turbulent Reacting Mixing Layer,” (by R.S. Miller, C.K. Madnia and P. Givi, *Combustion Science and Technology*, **99**, 1-36, 1994) selected for inclusion in the book *ONR Investing in the Future 1946-1996*, pp. 581-617, in celebration of the 50th Anniversary of the Office of Naval Research, Washington, DC, May 1996.

Ralph R. Teeter Educational Award, Society of Automotive Engineers, 1996.

BOEING Fellowship (1984-1989).

## 4. SERVICES

### 4.1. Professional:

UB Representative, University Space Research Association Council of Institutions, Washington, D.C., March 30-31 2017.

UB Representative, University Space Research Association Council of Institutions, Washington, D.C., March 30-31 2016.

UB Representative, University Space Research Association Council of Institutions, Washington, D.C., March 26-27 2015.

UB Representative, University Space Research Association Council of Institutions, Washington, D.C., March 27-28 2014.

UB Representative, University Space Research Association Council of Institutions, Washington, D.C., March 28-29 2013.

UB Representative, University Space Research Association Council of Institutions, Washington, D.C., March 22-23 2012.

UB Representative, University Space Research Association Council of Institutions, Columbia, MD, March 31- April 1, 2011.

UB Representative, University Space Research Association Council of Institutions, Columbia, MD, March 24-25 2010.

UB Representative, University Space Research Association Council of Institutions, Columbia, MD, March 25-26 2009.

UB Representative, University Space Research Association Council of Institutions, Columbia, MD, March 27-28 2008.

Invited Reviewer, Sandia National Laboratories, Combustion Research Facility, Livermore, CA, March 5-7 2007.

UB Representative, University Space Research Association Council of Institutions, Columbia, MD, March 29-30 2007.

Deputy Director of Education for the AIAA Northeast Region I (1999-2004).

Invited Panelist, Unsolicited Proposals to the Combustion, Fire, and Plasma Systems (CBET), Chemical and Transport Systems Division. National Science Foundation (NSF), Arlington, VA, 9-10 May, 2013.

Invited Reviewer, U.S. Department of Energy (DOE) ACSI Alliance Center at Utah. October 3-4 2005.

Invited Panelist, Unsolicited Proposals to the Particulate and Multiphase Processes Program, Chemical and Transport Systems Division. National Science Foundation (NSF), Arlington, VA, April 2005.

Invited Panelist, Unsolicited Proposals to the Combustion and Plasma Systems, Chemical and Transport Systems Division. National Science Foundation (NSF), Arlington, VA, December 2005.

Invited Panelist, Proposals for Information Technology Research (ITR), NSF, Arlington, VA, June 2004.

Invited Panelist, Proposals for CISE-Major Research Instrumentation (MRI) Program, NSF, Arlington, VA, March 2000.

Invited Panelist, Proposals for Small Business Innovative Research (SBIR), NSF, Arlington, VA, May 1996.

Reviewer, Journal of Fluid Mechanics, Physics of Fluids, AIAA Journal, Combustion and Flame, Combustion Science and Technology, and the Combustion Institute.

Reviewer, Prentice-Hall, McGraw Hill Co., John Wiley & Sons, Cambridge University Press.

#### **4.2. University and Schoolwide:**

Member, INS Faculty Search Committee, 2009-2010.

Member, ICT Faculty Search Committee, 2009-2010.

Representative of UB in University Space Research Association (USRA) (2003-present).

Secretary of the USRA Region II.

AIAA Faculty Advisor, UB (1993-2013).

ASME Human Powered Vehicle Faculty Advisor, UB (1997-2001).

Member, SEAS Computing Committee, UB (1997-1998).

#### **4.3. Departmental:**

Chair, Faculty Search Committee for Fluids and Thermal Sciences (2015-2016).

Member, Faculty Search Committee for Fluids and Thermal Sciences (2013-2014).

Member, Graduate Studies Committee (Spring 2002-present).

Chair, Faculty Search Committee for Fluids and Thermal Sciences (2002-2004).

Director, Undergraduate Studies in Aerospace Engineering (Spring 1999-Fall 2000).

Organizer, Departmental Seminar Series (Fall 1998).

Organizer, Turbulence Seminar Series (1998-2003).

Member, Undergraduate Programs Committee (1998-present).

Subcommittee Chair, Curriculum Revision (1998-2000).

Member, Ph.D. Qualifying Exam Committee (1997, 1999, 2000, 2001).

Member, Committee to restore the J79 turbojet engine in Furnas Hall (1996).

#### **4.4. Professional Memberships:**

Member, *Tau Beta Pi* Engineering Honor Society.

Council member, AIAA Niagara Frontier Professional chapter.

Member, American Physical Society (APS).

Member, Combustion Institute.

Associate Fellow, American Institute of Aeronautics and Astronautics (AIAA).

Member, American Society of Mechanical Engineers (ASME).

## 5. COURSES TAUGHT

### Spring 2017:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE 516, Fluid Mechanics II, graduate course.

### Fall 2016

MAE 515, Fluid Mechanics I, graduate course.

### Spring 2016:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE 516, Fluid Mechanics II, graduate course.

### Fall 2015

MAE 515, Fluid Mechanics I, graduate course.

### Spring 2015:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE 516, Fluid Mechanics II, graduate course.

### Fall 2014

MAE 515, Fluid Mechanics I, graduate course.

### Spring 2014:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE 516, Fluid Mechanics II, graduate course.

### Fall 2013

MAE 515, Fluid Mechanics I, graduate course.

### Spring 2013:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE 516, Fluid Mechanics II, graduate course.

### Spring 2012:

Sabbatical leave.

Fall 2012

MAE 515, Fluid Mechanics I, graduate course.

Fall 2011

MAE 515, Fluid Mechanics I, graduate course.

MAE 424, Aerodynamics (lecture and lab), senior level required course.

Spring 2011:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE 422, Gas Dynamics, senior level required course.

Fall 2010

MAE 515, Fluid Mechanics I, graduate course.

Spring 2010:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE 422, Gas Dynamics, senior level required course.

Fall 2009

MAE 424, Aerodynamics (lecture and lab), senior level required course.

Spring 2009:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE 422, Gas Dynamics, senior level required course.

Fall 2008:

MAE 424, Aerodynamics (lecture and lab), senior level required course.

Spring 2008:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE 422, Gas Dynamics, senior level required course.

Fall 2007:

MAE 424, Aerodynamics (lecture and lab), senior level required course.

Spring 2007:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE 422, Gas Dynamics, senior level required course.

Fall 2006:

MAE 424, Aerodynamics (lecture and lab), senior level required course.

Spring 2006:

Sabbatical leave.

Fall 2005:

MAE 424, Aerodynamics (lecture and lab), senior level required course.

Spring 2005:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE 422, Gas Dynamics, senior level required course.

Fall 2004:

MAE 424, Aerodynamics (lecture and lab), senior level required course.

Spring 2004:

MAE 422. Gas Dynamics, senior level required course.

Fall 2003:

MAE 424, Aerodynamics (lecture and lab), senior level required course.

Spring 2003:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE 422. Gas Dynamics, senior level required course.

Fall 2002:

MAE 424, Aerodynamics (lecture and lab), senior level required course.

Spring 2002:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE 422. Gas Dynamics, senior level required course.



Fall 2001:

MAE 424, Aerodynamics (lecture and lab), senior level required course.

Spring 2001:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE 422. Gas Dynamics, senior level required course.

Fall 2000:

MAE 424, Aerodynamics (lecture and lab), senior level required course.

Spring 2000:

MAE/ASE 422. Gas Dynamics, senior level required course.

Fall 1999:

MAE/ASE 424, Aerodynamics (lecture and lab), senior level required course.

Spring 1999:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE/ASE 422. Gas Dynamics, senior level required course.

Fall 1998:

MAE/ASE 424, Aerodynamics (lecture and lab), senior level required course.

MAE 459. Design Project, senior level required course.

Spring 1998:

MAE 519/CIE 561, Turbulent Flows, graduate course.

MAE/ASE 422. Gas Dynamics, senior level required course.

Fall 1997:

MAE/ASE 424, Aerodynamics.

Spring 1997:

MAE/ASE 422. Gas Dynamics.

MAE 459. Design Project.

Fall 1996:

EAS 140. Engineering Solutions, freshman level required course.

Spring 1996:

MAE/ASE 415. Aerospace Structures I, senior level required course.

MAE 459. Design Project.

Fall 1995:

EAS 140. Engineering Solutions.

Spring 1995:

MAE/ASE 422. Gas Dynamics.

MAE 459. Design Project.

Fall 1994:

EAS 103. Introduction to Engineering.

Spring 1994:

MAE/ASE 422. Gas Dynamics.

MAE 459. Design Project.

Fall 1993:

EAS 103. Introduction to Engineering.

Spring 1993:

MAE/ASE 422. Gas Dynamics.

MAE 459. Design Project.

Fall 1992:

EAS 103. Introduction to Engineering.

## 6. RESEARCH PERSONNEL SUPERVISION

### 6.1. Postdoctoral:

Dr. Farhad A. Jaberi (June 1996-August 1999). Ph.D. in Mechanical Engineering from UB (1996).

### 6.2. Current Student Advisee:

Nicholas DiGregorio, M.S.

### 6.3. Former Graduate Student Advisee:

#### Ph.D.:

Reza Jahanbakhshi (2011-2016). Ph.D. in Mechanical Engineering, August 2016. Dissertation: DNS of Compressible Reacting Turbulent Shear Layer. Current Position: Postdoctoral Research Associate, Department of Mechanical Engineering, Johns Hopkins University, Baltimore, ME.

Navid Samadi Vaghefi (2009-2014). Ph.D. in Mechanical Engineering, August 2014. Dissertation: Simulation and Modeling of Compressible Turbulent Mixing Layer. Current Position: Senior Analyst, Credit Risk Analytics, Manulife Financial, Toronto, Canada.

Arvind Pattamatta (2005-2009). Ph.D. in Aerospace Engineering, June 2009. Dissertation: Modeling Energy Transport in Nanostructures. Current Position: Assistant Professor, Department of Mechanical Engineering, Indian Institute of Technology, Madras, India.

Cosmin Safta (1998-2004). Ph.D. in Mechanical Engineering, February 2004. Dissertation: Interaction of a Vortex Ring with a Non-premixed Methane Flame. Current Position: Research Scientist, Sandia National Laboratory, CA.

Daniel Livescu (1996-2001). Ph.D. in Mechanical Engineering, September 2001. Dissertation: Mixing and Chemical Reaction in Compressible Turbulence. Current position: Research Scientist, Los Alamos National Laboratory, Los Alamos, NM.

Sunil James (1994-1998). Ph.D. in Mechanical Engineering, February 1998. Dissertation: Realistic Chemistry in Large Scale Numerical Simulations of Methane Diffusion Flames. Co-advised with P. Givi. Current Position: Senior Project Engineer, Rolls-Royce Company, Indianapolis, IN.

Craig J. Steinberger (1992-1997). Ph.D. in Mechanical Engineering, February 1997. Dissertation: Computational Analysis of Some Physical Issues in Nonpremixed and Premixed Turbulent Flames. Co-advised with P. Givi. Current Position: Systems Engineer, SUN Inc., Rochester, NY.

Farhad A. Jaberi (1992-1996). Ph.D. in Mechanical Engineering, June 1996. Dissertation: Mathematical Modeling and Computational Analysis of Turbulent Mixing and Reacting Systems. Co-advised with P. Givi. Current Position: Associate Professor of Mechanical Engineering, Michigan State University, East Lansing, MI.

Richard S. Miller (1993-1995). Ph.D. in Mechanical Engineering, June 1995. Dissertation: Passive Scalar, Magnetic Field, and Solid Particle Transport in Homogeneous Turbulence. Co-advised with

P. Givi. Current Position: Associate Professor of Mechanical Engineering, Clemson University, Clemson, SC.

Steven H. Frankel (1990-1993). Ph.D. in Aerospace Engineering, June 1993, Dissertation: Probabilistic and Deterministic Description of Turbulent Flows with Nonpremixed Reactants. Co-advised with P. Givi. Current Position: Professor, School of Mechanical Engineering, Purdue University, West Lafayette, IN.

#### M.S.:

Nicole L. Mauck, (2007-2009). M.S. in Mechanical Engineering, June 2009. Project: Effects of Noncircular Orifices on the Damping Characteristics of Industrial Hydraulic Shock Absorbers. Current Position: Applications Engineer, ITT Enidine, Buffalo, NY.

Nidheesh Bharadwaj, (2003-2006). M.S. in Mechanical Engineering, July 2006. Thesis: Interaction of a non-premixed flame with an inert wall. Current Position: Ph.D. student at the University of Wisconsin, Madison, WI.

Farzin Jalilighadr, (2002-2004, 2006-2007). M.S. in Mechanical Engineering, May 2007. Thesis: Direct numerical simulation of bluff-body stabilized flames.

Ioana Constantin (2003-2004). M.S. in Aerospace Engineering, December 2004. Current Position: Project Engineer, Bosch, Bamberg, Germany.

Vincent Moerman (2002-2003). M.S. in Aerospace Engineering, September 2003. Project: A Parametrical Study of a 2-D Dump-Stabilized Burner. Current Position: Project Engineer, Apsys, Toulouse, France.

Stefan Enachescu (1996-1999). M.S. in Aerospace Engineering, September 1999. Thesis: Laminar Diffusion Flame-Vortex Ring Interaction. Current Position: Project Engineer, MSX International, Dearborn, MI.

Jeffrey Hewett (1994-1996). M.S. in Aerospace Engineering, September 1996. Thesis: Flame-Vortex Interaction in a Reacting Vortex Ring.

Sunil James (1992-1994). M.S. in Aerospace Engineering, June 1994. Thesis: Direct Numerical Simulation of Vortex Rings. Advisor in the capacity of a Research Assistant Professor.

Richard S. Miller (1992-1993). M.S. in Aerospace Engineering. June 1993. Thesis: Structure of a Reacting Turbulent Mixing Layer. Co-advised with P. Givi.

Craig J. Steinberger (1989-1991). M.S. in Aerospace Engineering, June 1991. Thesis: Mixing and Non-Equilibrium Chemical Reaction in a Compressible Mixing Layer. Co-advised with P. Givi.

#### **6.4. Undergraduate Research Aides:**

Peter Kovachi (2004-2005), supported by UB's McNair Scholars Program. Project: Aerodynamic force and moment measurements of NASA airfoils.

Christopher M. Nuckols (1995-1996), supported by NASA/CORNELL Fellowship Award. Project: Three-dimensional Visualization of Vortical Reacting Flows.

Ward W. Vuillemot (1997-1998), supported by ACS-PRF as an undergraduate research aide. Project: Flow Visualization of Reacting Turbulent Flows.

### **6.5. Graduate Committee Assignments:**

#### **Ph.D.:**

Markus Tremmel. Dissertation: Application of the Time-Averaged Navier-Stokes Equations to an Asymmetric Fan Geometry. March 2004 (Chair: D.B. Taulbee).

Yousik Hong. Dissertation: Bubble Dynamics on a Micro-heater Under Pulse. March 2004 (Chair: N. Ashgriz).

Cristian R. Nastase. Dissertation: Direct Spectral/HP Element Simulation of Piloted Jet Non-Premixed Flames. February 2004 (Chair: P. Givi).

Mazlan Abdul Wahid. Dissertation: Rotating Flame Characteristics. February 2003 (Chair: N. Ashgriz).

Suchuan Dong. Dissertation: Direct Numerical Simulation of the Mixing Tab Flow. August 2001 (Chair: H. Meng).

Laurent Y.M. Gicquel. Dissertation: Velocity Filtered Density Function for Large Eddy Simulation of Turbulent Flows. June 2001 (Chair: P. Givi).

Chang-Fang Hsu. Dissertation: Numerical Simulation of a Droplet Impact on a Porous Substrate. February 2001 (Chair: N. Ashgriz).

Jens Knoell. Dissertation: Modeling the Reynolds Stresses in Turbulent Shear Flows. June 2000 (Chair: D.B. Taulbee).

Virgil Adumitroaie. Dissertation: Quasi-Explicit Algebraic Turbulence Closures in Compressible Reacting Flows. June 1997 (Chair: P. Givi).

Paul J. Colucci. Dissertation: Large Eddy Simulation of Turbulent Reactive Flows: Stochastic Representation of the Subgrid Scale Scalar Fluctuations. February 1998 (Chair: P. Givi).

#### **M.S.:**

Eugene M. Grigoriev, MSc Project: Unsteady Force Calculation via Vortex Panel Method. December 2013 (Chair: Iman Borazjani).

Reza M.H. Sheikhi, Comprehensive Exam, August 2002.

Jennifer Richards, Comprehensive Exam, April 2002.

Charlton Benjamin, Comprehensive Exam, May 2001.

Hongbin Bian. Thesis: Experimental Study of Bubble Dynamics. June 2001, (Chair: N. Ashgriz).

Yining Lin. Thesis: Surface Characterization of Plain Paper as Applied to Paper-Ink Interactions in Ink-Jet Printing. Department of Chemical Engineering, September 1999, (Chair: P. Alexandridis).

Ercan Dumlupinar. Thesis: Computational Modeling of Centrifugal Blower Performance. September 2000 (Chair: D.B. Taulbee).

Marcus Johansson. Thesis: A Nonlinear Stress-Strain Model Accounting for Dissipation Anisotropies. June 2000 (Chair: D.B. Taulbee).

Malcolm Arvidsson. Thesis: Improvements of an Algebraic Reynolds Stress Model for Adverse Pressure Gradient Boundary Layers,” February 2000, (Chair: D.B. Taulbee).

Stephan Gamard. Thesis: A New Similarity Analysis of the Turbulence Energy Spectrum, February 1999 (Chair: W.K. George).

Jens Knoell. Thesis: A Non-linear Stress-Strain Model for Wall-Bounded Turbulent Flows. September 1998 (Chair: D.B. Taulbee).

## 7. PUBLICATIONS

*Invited publications are identified by ★*

### 7.1. Book Chapters and Lead Articles:

- ★ M.R.H. Sheikhi, T.G. Drozda, C.K. Madnia, and P. Givi, “Structure of Nonpremixed Turbulent Flames,” Chapter in *Explosion Dynamics and Hazards*, pp. 105–118, Editors: S.M. Frolov, F. Zhang, and P. Wolanski, Torus Press, Moscow, Russia (2010).
- ★ M.R.H. Sheikhi, T.G. Drozda, C.K. Madnia and P. Givi, FDF Methods for LES of Turbulent Reactive Flows, Chapter in *Nonequilibrium Processes: Plasma, Combustion and Atmospheric Phenomena*, Editors: G.D. Roy, S.M. Frolov and A.M. Starik, Torus Press, Moscow, Russia, 2008.
- ★ Madnia, C.K., Jaber, F.A. and Givi, P., “Large Eddy Simulation of Heat and Mass Transport in Turbulent Flows,” Chapter 5 in *Handbook of Numerical Heat Transfer*, pp. 167-189, Editors: W.J. Minkowycz, E.M. Sparrow and J.Y. Murthy, John Wiley & Sons publishers, New York, NY, 2006.
- Livescu, D. and Madnia, C.K., “Non-premixed flame-turbulence interaction in compressible turbulent flow,” in *Advances in Turbulence IX*, pp. 809-822, Editors: I.P. Castro, P.E. Hancock, and T.G. Thomas, CIMNE publishers, Barcelona, Spain, 2002.
- ★ Livescu, D. and Madnia, C.K., “Compressibility Effects on the Scalar Mixing in Reacting Homogeneous Turbulence,” in *Turbulent Mixing and Combustion*, pp. 125-135, Editors: A. Pollard and S. Candel, Kluwer Academic Publishers Dordrecht, The Netherlands, 2002.
- ★ Livescu, D. and Madnia, C.K., “Anisotropy in Reacting Compressible Turbulent Shear Flow,” in *DNS/LES Progress and Challenges*, pp. 613-620, Editors: C. Liu, L. Sakell, T. Beutner, Greyden Press, Columbus, Ohio, 2001.

- ★ Jaber, F.A., Mashayek, F., Madnia, C.K., Taulbee, D.B. and Givi, P., “Advances in Analytical Description of Turbulent Reacting Flows,” in *Advances in Chemical Propulsion*, Editor: G.D. Roy, Taylor & Francis, Washington, D.C., 2000.
- ★ Madnia, C.K. and Givi, P., “Direct Numerical Simulation and Large Eddy Simulation of Reacting Homogeneous Turbulence,” Chapter 15 in *Large Eddy Simulations of Complex Engineering and Geophysical Flows*, pp. 315-346, Editors: Boris Galperin and Steven A. Orszag, Cambridge University Press, New York, NY, 1993.
- ★ Givi, P. and Madnia, C.K., “Spectral Methods in Combustion,” Chapter 8 in *Numerical Modeling in Combustion*, pp. 409-452, Editor: T.J. Chung, Taylor & Francis, Washington, D.C., 1993.

## **7.2. Journal Articles and other Refereed Publications:**

Jahanbakhshi, R. and Madnia, C.K., “Entrainment in a Compressible Turbulent Shear Layer,” *Journal of Fluid Mechanics*, Vol. **797**, pp. 564-603, 2016.

Jahanbakhshi, R., Vaghefi, N.S. and Madnia, C.K., “Baroclinic Vorticity Generation Near the Turbulent/Non-turbulent Interface in a Compressible Shear Layer,” *Physics of Fluids* **27**, 105105, 2015.

Vaghefi, N.S. and Madnia, C.K. “Local Flow Topology and Velocity Gradient Invariants in Compressible Turbulent Mixing Layer,” *Journal of Fluid Mechanics*, Vol. **774**, pp. 67-94, 2015.

Vaghefi, N.S., Nik, M.B., Piscuneri, P.H. and Madnia, C.K., “A Priori Assessment of the Subgrid Scale Viscous/Scalar Dissipation Closures in Compressible Turbulence”, *Journal of Turbulence*, **14(9)**, 43-61, 2013.

Pattamatta, A. and Madnia, C.K., “Modeling Carrier-Phonon Nonequilibrium Due to Pulsed Laser Interaction With Nanoscale Silicon Films,” *Journal of Heat Transfer*, Vol. **132**, pp. 082401-1–082401-9, 2010.

Pattamatta, A. and Madnia, C.K., “Modeling Thermal Transport in Nanoparticle Composites,” *Journal of thermophysics and Heat Transfer*, Vol. **23**, No. 3, pp. 608-615, 2009.

Pattamatta, A. and Madnia, C.K., “Modeling Heat Transfer in Bi<sub>2</sub>Te<sub>3</sub>/Sb<sub>2</sub>Te<sub>3</sub> Nanostructure,” *International Journal of Heat and Mass Transfer*, Vol. **52**, pp. 860-869, 2009.

Pattamatta, A. and Madnia, C.K., “A Comparative Study of Two-Temperature and Boltzmann Transport Models for Electron-Phonon Non-Equilibrium,” *Numerical Heat Transfer, Part A*, Vol. **55:7**, pp. 611-633, 2009.

Pattamatta, A. and Madnia, C.K., Modeling Electron-Phonon Non-equilibrium in Gold Films using Boltzmann Transport Model,” *Journal of Heat Transfer*, Vol. **131**, pp. 082401-1–082401-8, 2009.

Givi, P., Sheikhi, M.R.H., Drozda, T.G. and Madnia, C.K., “Large Eddy Simulation of Turbulent Combustion,” in *Combustion and Plasma Chemistry*, in Russian, Vol. **6**, No. 1, pp. 1-9, 2008.

Drozda, T.G., Sheikhi, M.R.H., Madnia, C.K. and Givi, P., “Developments in Formulation and

- Application of the Filtered Density Function,” *Flow, Turbulence and Combustion*, Vol. **78**, No. 1, pp. 35-67, 2007.
- Bharadwaj, N, Safta, C., and Madnia, C.K., “Flame-Wall Interaction for a Nonpremixed Flame Propelled by a Vortex Ring,” *Combustion Theory and Modelling*, Vol. **11**, No. 1, pp. 119, 2007.
- Safta, C. and Madnia, C.K., “Autoignition and Structure of Non-Premixed  $CH_4/H_2$  Flames: Detailed and Reduced Kinetic Models,” *Combustion and Flame*, Vol. **144**, pp. 64-73, 2006.
- Livescu, D. and Madnia, C.K., “Small Scale Structure of Homogeneous Turbulent Shear Flow,” *Physics of Fluids*, Vol. **16**, No. 8, pp. 2864-2876, 2004.
- Safta, C. and Madnia, C.K., “Characteristics of methane diffusion flame in a reacting vortex ring,” *Combustion Theory and Modelling*, Vol. **8**, Issue 3, pp. 449-474, 2004.
- Livescu, D., Jaber, F.A. and Madnia, C.K., “The Effects of Heat Release on the Energy Exchange in Reacting Turbulent Shear Flow,” *Journal of Fluid Mechanics*, Vol. **450**, pp. 35-66, 2002.
- Safta, C., Enachescu, S. and Madnia, C.K., “Interaction of a Vortex Ring With a Diffusion Flame,” *Physics of Fluids*, Vol. **14**, No. 2, pp. 668-681, 2002.
- Livescu, D., Jaber, F.A. and Madnia, C.K., “Passive-Scalar Wake Behind a Line Source in Grid Turbulence,” *Journal of Fluid Mechanics*, Vol. **416**, pp. 117-149, 2000.
- Jaber, F.A., Livescu, D. and Madnia, C.K., “Characteristics of Chemically Reacting Compressible Homogeneous Turbulence,” *Physics of Fluids*, Vol. **12**, No. 5, pp. 1189-1209, 2000.
- Hewett, J.S. and Madnia, C.K., “Flame-Vortex Interaction in a Reacting Vortex Ring,” *Physics of Fluids*, Vol. **10**, No. 1, pp. 189-205, 1998.
- Jaber, F.A. and Madnia, C.K., “Effects of Heat of Reaction on Homogeneous Compressible Turbulence,” *Journal of Scientific Computing*, Vol. **13**, No. 2, pp. 202-228, 1998.
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## 8. PUBLIC LECTURES & SEMINARS

*Invited lectures are identified by \**

- ★ “Entrainment Across the Turbulent/Non-turbulent Interface,” Distinguished Seminar Series, Department of Mechanical Industrial Engineering, University of Toronto, Toronto, ONT, Canada, October 28, 2016.
- “Entrainment in a Reacting Compressible Shear Layer,” 69th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Portland, OR, November 21, 2016.
- “Flow Dynamics Near the Turbulent/Non-Turbulent Interface in Compressible Shear Layers,” 67th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, San Francisco, CA, November 23, 2014.
- “Local Flow Topology in Compressible Turbulent Shear Layers,” 67th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, San Francisco, CA, November 23, 2014.
- “The Turbulent/Non-Turbulent Interface in Non-Premixed Reacting Mixing Layers,” 66th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Pittsburgh, PA, November 24, 2013.
- “Modeling and Simulation,” Web update presentation to members of National Center for Hypersonic Combined Cycle Propulsion (NCHCCP), June 15, 2012.
- “Modeling and Simulation,” Web update presentation to members of National Center for Hypersonic Combined Cycle Propulsion (NCHCCP), January 23 , 2012.
- “Assessment of the FDF Sub-Closures in Compressible Turbulence,” 64th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Baltimore, MD, November 21, 2011.
- “Modeling and Simulation,” Web update presentation to members of National Center for Hypersonic Combined Cycle Propulsion (NCHCCP), May 3, 2010.
- “DNS of Turbulent Combustion,” University of Virginia NCHCCP, Charlottesville, VA, July 8, 2009.
- “Modeling Thermal Transport in Nanoparticles,” 40th AIAA Thermophysics Conference, Seattle, Washington, June 24, 2008.
- “Electron-Phonon Non-equilibrium in Nanoscale Gold Films,” ASME International Mechanical Engineering Congress and Exposition, Boston, Massachusetts, November 6, 2008.
- “Aerospace at SUNY-Buffalo,” USRA COI Regional Meeting, Princeton, NJ, February 14, 2008.
- “Nanoscale Heat Transfer in Thermoelectric Materials,” University of Minnesota, Twin Cities, MN, October 31, 2007.



“Modeling Thermal Transport in Two-dimensional Nanocomposites,” 59th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Tampa Bay, Florida, November 20, 2006.

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★ “Tackling Turbulent Combustion with Supercomputers,” Center for Computational Research, University at Buffalo, Buffalo, NY, January 15, 2002.

★ “Compressibility Effects on the Scalar Mixing in Reacting Homogeneous Turbulence,” IUTAM Symposium on Turbulent Mixing and Combustion, Kingston, Canada, June 4, 2001.

★ “Anisotropy in Reacting Compressible Turbulent Shear Flow,” 3rd AFOSR International Conference on DNS/LES, Arlington, Texas, August 7, 2001.

“Heat Release Effects on Dilatational Motions in Turbulent Reacting Shear Flow,” 53rd Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Washington D.C., November 20, 2000.

“Vortex Ring-Diffusion Flame Interaction: A Numerical Study,” 52nd Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, New Orleans, Louisiana, November 23, 1999.

“Numerical Study of Decaying Isotropic Turbulent Reactive Flows,” 51st Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Philadelphia, PA, November 24, 1998.

“Flame-Turbulence Interaction in Homogeneous Flows,” 50th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, San Francisco, CA, November 24, 1997.

★ “Flame-Vortex Interaction in a Reacting Vortex Ring,” International Colloquium on Advanced

Computation & Analysis of Combustion, Moscow, Russia, May 13, 1997.

- ★ “Flame-Vortex Interaction: A Numerical Study,” Department of Mechanical Engineering, Aeronautical Engineering & Mechanics, Rensselaer Polytechnic Institute, Troy, NY, April 4, 1997.
- ★ “Direct Numerical Simulation of Reacting Vortex Rings,” Department of Physics, State University of New York, Buffalo, NY, March, 11 1997.

“Vorticity Dynamics in Reacting Vortex Rings,” 49th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Syracuse, NY, November 25, 1996.

“Direct Numerical Simulation of Laminar Vortex Rings,” 47th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Atlanta, GA, November 20, 1994.

“Method of Translation for Stochastic Modeling of Binary Scalar Mixing in Isotropic Turbulence,” 45th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Tallahassee, FL, November 23, 1992.

- ★ “Some Issues of Interest in Computational and Mathematical Analysis of Turbulent Reacting Flows,” Theoretical Flow Physics Branch, NASA Langley Research Center, Hampton, VA, May 15, 1992.

“Mathematical Modeling of the Reactant Conversion Rate by Single-Point PDF Methods,” Fall Technical Meeting of the Combustion Institute, Eastern Section, Cornell University, Ithaca, NY, October 15, 1991.

“On DNS and LES of Reacting Compressible Homogeneous Turbulence,” Fall Technical Meeting of the Combustion Institute, Eastern Section, Orlando, FL, December 4, 1990.

“Interaction of a Turbulent Round Jet with a Solid Surface,” The University of Michigan Gas Dynamics Laboratory Meeting, Ann Arbor, MI, March 24, 1989.

“A Comparative Study of Free surface Jets and Wall Jets,” 42nd Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Palo Alto, CA, November 21, 1989.

“Free Surface Signature of a Submerged Turbulent Jet,” Annual Midwestern Universities Fluid Mechanics Retreat, Geneva Center, Rochester, IN, April 14, 1989.

“Dynamics of Turbulent Jets Near a Free Surface,” 41st Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Buffalo, NY, November 21, 1988.

“Interaction of an Axisymmetric Turbulent Water Jet with the Free Surface,” 40th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Eugene, OR, November 22, 1987.

“Turbulent Jets: Surface Waves and Surface Motions,” University of Michigan Gas Dynamics Laboratory Meeting, Ann Arbor, Michigan, October 14, 1987.

## **9. GRANT SUPPORT**

### 9.1. Funded:

Principal Investigator, “Numerical Simulation and Modeling of Atomization of Hydrocarbons,” American Chemical Society-Petroleum Research Fund, \$100,000, 2012-2015. Grant Number: ACS-PRF 51834-ND9. (100%)

Principal Investigator, “National Center for Hypersonic Combines Cycle Propulsion (NCHCCP),” AFOSR/NASA, \$450,000, 2009-2013. (100%)

Principal Investigator, “Large Eddy Simulation of Turbulent Combustion via the Filtered Density Function ,” NASA, \$149,670, 2008-2011. (100%)

Principal Investigator, “Physical Modeling and Large Scale Numerical Simulation of a Dump Combustor,” American Chemical Society-Petroleum Research Fund, \$80,000, 2004-2007. Grant Number: ACS-PRF 41643-AC9. (100%)

Principal Investigator, “Modeling and Numerical Simulation of Complex Turbulent Non-premixed Flames,” American Chemical Society-Petroleum Research Fund, \$80,000, 2002-2004. Grant Number: ACS-PRF 38333-AC9. (100%)

Principal Investigator, “Modeling and Direct Numerical Simulation of Hydrocarbon Flame-Vortex Interactions,” American Chemical Society-Petroleum Research Fund, \$60,000, 2000-2002. Grant Number: ACS-PRF 35064-AC9. (100%)

Co-Principal Investigator: “Filtered Mass Density Function for Design Simulation of High Speed Airbreathing Propulsion Systems,” NASA Langley Research Center. \$94,817, 1999-2002. Grant Number: NAG 1-2238, (Co-PI: P. Givi) (50%)

Principal Investigator, CAREER Award, NSF, \$207,500, 1996-2001. Grant Number: CTS-9623178. (100%)

Principal Investigator, “Numerical Simulation and Modeling of Methane Flames,” American Chemical Society-Petroleum Research Fund, \$20,000, 1996-1998. Grant Number: ACS-PRF 30619-G9. (100%)

Co-Principal Investigator, “Physical Chemistry of Inks Wetting Paper,” Xerox Corporation, \$7500, 1998-1999. (Co-PI: P. Alexandridis). (50%)

Co-Principal Investigator, “Simulation of High-Speed Turbulent Reacting Flows,” NASA Langley Research Center, Hampton, VA, Research Grant Number: NAG 1-1122, \$95,616, 1996- 1999. (Co-PIs: P. Givi and D.B. Taulbee). (33%)

Co-Principal Investigator, “High Speed Complex Turbulent Reacting Flows: Modeling, Simulations and Experimental Validations” Wright Patterson Air Force Base through NASA Grant NAG-1-1122, \$47,520, 1996-1997. (Co-PIs: P. Givi and D.B. Taulbee). (33%)

Co-Principal Investigator, “Stochastic Modeling and Simulation of Multiphase Reacting Turbulent Flows with Complex Chemistry,” Office of Naval Research, Grant Number: N00014-94-1-0677, \$364,844, 1994-1998. (Co-PIs: P. Givi and D.B. Taulbee). (33%)

Co-Principal Investigator, "LES, DNS and RANS for the Analysis of High-Speed Turbulent Reacting Flows," NASA Langley Research Center, Grant Number: NAG 1-1122, \$195,000, 1993-1996. (Co-PIs: P. Givi and D.B. Taulbee). (33%)