

## SHERYL M. GRACE

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### CURRENTLY:

- Associate Professor of Mechanical Engineering at Boston University

### CURRENT PROFESSIONAL AFFILIATIONS:

- ASME member.
- AIAA Associate Fellow.

### EDUCATION:

**Ph.D.** Aerospace and Mechanical Engineering, May, 1995, University of Notre Dame

Thesis: An Inverse Problem for a Nonuniform Subsonic Flow Interacting with a Body and Radiating Sound

**M.S.** Aerospace and Mechanical Engineering, May, 1993, University of Notre Dame

Thesis: The Acoustic Directivity from Airfoils in Subsonic Nonuniform Flows

**M.S.** Applied Mathematics, May, 1991, Oklahoma State University

Thesis: The van der Pol Equation: A Study of Qualitative Behavior of Solutions to Nonlinear Differential Equations

**B.S.** Applied Mathematics (minor Computer Science), May, 1989, University of Akron

### WORK and PROFESSIONAL EXPERIENCE:

- Boston University
  - Associate Professor of (Aerospace and) Mechanical Engineering, (2001-present)
  - Assistant Professor of Aerospace and Mechanical Engineering (1995-2001)
  - Department search committee (Spring 2008)
  - Council for Faculty Diversity and Inclusion (Fall 2006-Spring 2008)
  - Developer and Instructor for College's U-Design Camp: Flight school for middle-school students. (Summer 2007).
  - College of Engineering Dean's search Committee (2006)
  - Women in Science and Engineering Founder, Chair (2004-2006), Vice-chair (2006-2008)
  - Undergraduate committee AME Dept. (2000-present)
  - BU AME Department ABET coordinator, Fall, 2002.
  - Board member, Center for Excellence in Teaching, BU. (2001-2002)
  - Faculty advisor for student chapter of AIAA at Boston University, "outstanding chapter" award 96/97, 98/99, & 00/01 (spring 1995-spring 2002)
  - Speaker coordinator for BU Pathways science outreach program (1999-2002)
  - Associate chair for the Aerospace Program at Boston University, Undergraduate engineering committee member at Boston University, ABET coordinator (1996-1998)
- ASME
  - Executive Committee Noise Control and Acoustics Division: Secretary/Treasurer 2003, Chair 2004, Vice Chair 2005.
  - ASME, NCAD program chair for IMECE, Fall, 2004.
- AIAA
  - Aeroacoustics Technical Committee 2001-2006, Meetings Subcommittee Chair 2002-2005.
  - AIAA, Aeroacoustics program chair for Aerospace Sciences Meeting, Jan. 2003.
- Proposal review panels: AFOSR 2003,2004, DOD SERDP 2006, NSF CMMI 2006, 2007, NSF CBET 2008.

- ASEE Summer faculty fellow at David Taylor Model Basin (ONR) (2002)
- Member of Graduate Council for The University of Notre Dame, June 98 - May 01
- Post-Doctorate, The University of Notre Dame (1995)
- Computer Programmer, Mechanical Engineering Group, Phillips Petroleum Company, Bartlesville, OK (1990)

#### **INVITED LECTURES:**

- 2009** “Work/Life Balance Panel,” Association of Women in Science (AWIS) MA Chapter, April 22.
- 2004** “Tutorial: Computational Methods in Aeroacoustics,” *ASME IMECE*, November 17.
- 2004** “Fundamentals of Aeroacoustics,” part of the von Karman Institute for Fluid Dynamics Lecture series 2003-04, *Advances in Aeroacoustics and Applications*, March 15-17.
- 2004** “Exterior Acoustic Modeling: Wings and Gerbils,” Institute for Vibration and Sound, Southampton University, UK, Feb.
- 2004** “Exterior Acoustic Modeling for Gerbils,” Combustion and Acoustics Group, Mechanical Engineering, Cambridge University, Feb.
- 2004** “Acoustic Modeling of Wings,” Department of Mathematics and Theoretical Physics, Cambridge University, UK, Jan.
- 2002** “Computation of Aeroacoustics: A Continuing Challenge,” Given to the faculty and graduate students at the University of Poitiers, May 17.
- 2001** “Women in Engineering: Challenges and Opportunities,” Given at Women in Technology job fair, Bedford, MA, June 16.
- 2001** “Aerodynamic Sound in Unbounded Flows,” Compact Green’s Functions,” and “Vortex Sound in A Bounded Flow,” part of the von Karman Institute for Fluid Dynamics Lecture series 2001-02, *Advances in Aeroacoustics*, March 12-16.
- 2001** “Computational Aeroacoustics: Introduction and Application,” Given to researchers at FLUENT Inc., NH, March 23.
- 2001** “Boundary Element Methods for Airframe Noise Prediction,” Given as part of the Aerospace and Mechanical Engineering Seminar Series at Worcester Polytechnic Institute, Worcester, MA, September 21.
- 2001** “An Overview of Computational Aeroacoustics Techniques Applied to Cavity Noise Prediction,” 39th AIAA Aerospace Sciences Meeting and Exhibit, January 8.
- 2000** Recent BEM Computations Applied to Airframe Noise Prediction,” Given as researchers at NASA Langley’s CFD/acoustics division, August 11.
- 2000** “Using Incompressible, Viscous, Computational, Fluid Dynamics As A Precursor To Acoustic Predictions,” Given to the Engineering and Math Departments at Akron University, February, 25.
- 2000** “One Woman’s Career: It Started With Maths At Akron,” An informal talk given to a gathering of women in science and engineering (undergraduate and graduate students as well as faculty) at Akron University, February 24.
- 1999** “The Sound In and Around a Cavity Due to Grazing Flow: A New Method of Calculation”, Given at ICIAM 99 in Edinburgh, July 9.
- 1999** “Influence of wall aperture shape on the motion of the shear layer spanning the aperture,” Given for Dept. of Mechanical Engineering at North Eastern, Feb. 12.
- 1998** “Acoustic Energy Dissipation in an Open-test-section Wind Tunnel,” Given to the Acoustics Department at Ecole Centrale de Lyon, June.
- 1998** “Aeroacoustics: Friend, Foe, Fun,” Given for the BU Pathways Program, April 14.
- 1995** “Unsteady Aerodynamics and Aeroacoustics: A Brief Overview of My Favorite Topic,” Given in the Aerospace and Mechanical Engineering Department at Oklahoma State University, December 1.

## JOURNAL ARTICLES:

- J-1 "Simulation of the binaural environmental transfer function for gerbils using a boundary element method," S. M. Grace, E. Quaranta, B. Shinn-Cunningham and H. F. Voigt, *Acta Acustica United with Acustica* 94:310-320, 2008.
- J-2 "Experimental Investigation of the Flow Characteristics Within a Shallow Wall Cavity for Both Laminar and Turbulent Upstream Boundary Layers," S. M. Grace, D. E. Wroblewski, and W. G. Dewar, *Experiments in Fluids*, 36:791-804, 2004.
- J-3 "Numerical Simulation of the Forced Wave Equation as an Acoustic Post-processing Technique for CFD," Sheryl M. Grace, *Aerotecnica Missili E Spazio, Journal of the Associazione Italiana di Aeronautica e Astronautica*, 79:3-4, 75-80, July-December, 2000.
- J-4 "Prediction of Low-frequency Tones Produced by Flow Through a Duct with a Gap," Sheryl M. Grace, *Journal of Sound and Vibration*, 229(4):859-878, Jan. 2000.
- J-5 "Inverse Aeroacoustic Problem for a Rectangular Wing in a Gust", Trevor H. Wood and Sheryl M Grace, *AIAA Journal*, 38(2):203-210, February, 2000.
- J-6 "Stability of High Reynolds Number Flow Past a Circular Aperture," Sheryl M. Grace, Trevor H. Wood, and Michael S. Howe, *Proceedings of the Royal Society of London*, 455:2055-2066, June, 1999.
- J-7 "The Influence of Shape on The Rayleigh Conductivity of a Wall Aperture in The Presence of Grazing Flow," Sheryl M. Grace, Kelly P. Horan and Michael S. Howe, *Journal of Fluids and Structures*, 12(3):335-351, April, 1998.
- J-8 "Direct Computations of Unsteady Flows About Thin Airfoils," Sheryl M. Grace, S. I. Hariharan, and Hafiz M. Atassi, *Journal of Computational Acoustics*, 6(3):337-355, 1998.
- J-9 "Modeling the Dynamics of Spring-Driven, Oscillating-Foil Propulsion," Karen A. Harper, Matthew D. Berkemeier and Sheryl M. Grace, *Journal of Oceanic Engineering*, 23(3):285-296, July, 1998.
- J-10 "Inverse Aeroacoustic Problem For A Streamlined Body. Part I: Basic Formulation," Sheryl M. Patrick Grace, Hafiz M. Atassi and William K. Blake, *AIAA Journal*, 34(11):2233-2240, November, 1996.
- J-11 "Inverse Aeroacoustic Problem For A Streamlined Body. Part II: Accuracy of Solutions," Sheryl M. Patrick Grace, Hafiz M. Atassi and William K. Blake, *AIAA Journal*, 34(11):2241-2246, November, 1996.
- J-12 "Direct Calculation of Sound Radiated From Bodies in Nonuniform Flows," Hafiz M. Atassi, Jiseng Fang and Sheryl M. Patrick, *Journal of Fluids Engineering*, 115:573-579, December 1993.

## CONFERENCE PAPERS AND TECHNICAL REPORTS:

- C-1 "Hybrid prediction of fan tonal noise," Sheryl M. Grace, Douglas L. Sondak, Daniel J. Dorney, and Michael Cannamela, *AIAA Paper No. 2008-2992*, 2008.
- C-2 "CFD Computation of Fan Interaction Noise," Sheryl M. Grace, Douglas L. Sondak, Daniel J. Dorney, and Michaela Logue, IMECE2007-43779, Proceedings of the IMECE 07, ASME, Seattle, WA, Nov. 2007.
- C-3 Editor of "Proceedings of the Noise Control and Acoustics Division 2003", (IMECE, ASME).
- C-4 "Wing Geometry Effect on Blade-Vortex Interaction Response Using BEM," Trevor H. Wood and Sheryl M. Grace, Proceedings of the 2001 ASME IMECE, NCAD, Nov. 2001.
- C-5 "Unsteady Blade Response: The BVI Model vs. The Gust Model," Sheryl M. Grace, AIAA Paper No. 2001-2209, 7th AIAA/CEAS Aeroacoustic Conference, Maastricht, The Netherlands, May, 2001.
- C-6 "An Overview of Computational Aeroacoustic Techniques Applied to Cavity Noise Prediction," Sheryl M. Grace, AIAA Paper No. 2001-0510, 39th AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2001.

- C-7 "Time-Dependent Calculation of Acoustic Radiation from Finite Wings Using BEM," Trevor H. Wood and Sheryl M. Grace, Proceedings for the 2000 ASME IMECE, NCAD, Nov. 2000.
- C-8 "Implications of Recent BVI Calculations on Prediction Methods for Noise from Turbulence Ingestion," ASEE Summer Faculty Project Report for NSWC Carderock Division, August, 2000.
- C-9 "Free-wake Analysis for Calculating The Aeroacoustics of A Wing-flap Configuration", Trevor. H. Wood, and Sheryl M. Grace, AIAA Paper No. 2000-0607, 38th AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, January, 2000.
- C-10 "Acoustic Computations Using Incompressible Inviscid CFD Results as Input", Sheryl M. Grace, Caroline K. Curtis, and Allan D. Pierce, *Proceedings of the ASME Noise Control and Acoustics Division, ASME IMECE*, Nashville, TN, November 1999. (Presented by Allan Pierce).
- C-11 "Aeroacoustic Predictions of A Wing-Flap Configuration In Three Dimensions," Trevor H. Wood and Sheryl M. Grace, Paper No. 99-1892, 5th AIAA/CEAS Aeroacoustics Conference, May 10-12, 1999, Seattle WA. (Presented by Trevor Wood)
- C-12 "Acoustic Energy Absorption by a Shear Layer," Sheryl M. Grace, AIAA Paper No. 98-2304, 4th AIAA/CEAS Aeroacoustics Conference, June 2-4, 1998, Toulouse, France.
- C-13 "Inverse Aeroacoustic Problem for a Rectangular Wing in a Gust," Trevor H. Wood and Sheryl M. Grace, Paper No. 98-2229, 4th AIAA/CEAS Aeroacoustics Conference, June 2-4, 1998, Toulouse, France. (Presented by Trevor Wood).
- C-14 "Reduction of the Complexity of the Intrinsically Nonlinear Problem of Aerodynamic Sound Generation in an Unbounded Domain," Sheryl M. Grace and Allan D. Pierce, *Proceedings of the IUTAM Symposium on Computational Methods for Unbounded Domains*, July, 1997.
- C-15 "The Influence of Grazing Flow on the Rayleigh Conductivity of an Aperture of Arbitrary Shape," Sheryl M. Grace, Michael S. Howe, and Kelly P. Horan, *Paper No. 97-1672*, for the 3rd AIAA/CEAS Aeroacoustics Conference, May, 1997.
- C-16 "Unsteady Aerodynamic Analysis for a Flat-plate Airfoil in Subsonic Mean Flow," Sheryl M. Grace, Boston University Tech. Rep. AM-97-004, January, 1997.
- C-17 "Decreasing the Energy Costs of Swimming Robots through Passive Elastic Elements," Karen A. Harper, Matthew D. Berkemeier and Sheryl M. Grace,, *Proceedings of the 1997 IEEE International Conference on Robotics and Automation*. (Presented by Karen Harper).
- C-18 "Predicting Unsteady Aerodynamic Parameters From Airfoil Surface Pressure Measurements," Sheryl M. Patrick Grace, NCA-Vol 22, *Proceedings of the ASME Noise Control and Acoustics Division*, November 1996, pp. 93-98.
- C-19 "An Inverse Problem in the Presence of a Mean Flow," Sheryl M. Grace, Boston University Tech. Rep. AM-96-017, August 1996.
- C-20 "Inverse Aeroacoustic Problem For A Rectangular Wing Interacting With A Gust," Sheryl M. Patrick and Hafiz M. Atassi, *AIAA 96-1790*, Presented at 2nd AIAA/CEAS Aeroacoustics Conference, State College, PA, May 1996.
- C-21 "Predicting The Unsteady Pressure on A Streamlined Body From Its Acoustic Signal," Sheryl M. Patrick, Hafiz M. Atassi and William K. Blake, *CEAS/AIAA-95-162*, Proceedings of the CEAS/AIAA Aeroacoustics Conference, Munich, Germany, June 1995, pp.1105-1114.
- C-22 "The Pressure Field of a Gust Interacting with a Flat Plate," Sheryl M. Patrick and Hafiz M. Atassi, ICASE/LaRC Workshop on Benchmark Problems in Computational Aeroacoustics, *NASA Conference Publication 3300*, May 1995, pp.291-296.
- C-23 "Inverse Problems in Unsteady Aerodynamics and Aeroacoustics," Sheryl M. Patrick, Hafiz M. Atassi and William K. Blake, *Active Control of Vibration and Noise*, ASME DE-Vol. 75, November 1994, pp. 309-319.
- C-24 "Acoustic Radiation from a Lifting Airfoil in Nonuniform Subsonic Flow," Sheryl M. Patrick, Hafiz M. Atassi and Catherine M. Davis, *Computational Aero- and Hydro Acoustics*, ASME FED, 175:117-122, June 1993.

## WORKSHOP AND CONFERENCE PRESENTATIONS (no proceedings):

1. "Simulation of turbofan interaction noise," ASME IMECE, Boston, MA 2008 (with collaborators Doug Sondak and Dan Dorney).
2. "Tutorial: Computational Methods for Aeroacoustics," ASME IMECE, Anaheim, CA, November 2004.
3. "Application of a New Post-processing method for predicting acoustic radiation when using incompressible, viscous, computational fluid dynamics," ASA, Columbus OH, November 1999. (with collaborators Caroline Curtis and Allan Pierce).
4. "Prediction of Sound from a High-lift Wing System Using a Coupled Panel Method and Acoustic Propagator," ASME IMECE, November, 1998. (with collaborator Trevor Wood).
5. "Resonant Frequencies for Thick Wall Apertures in Grazing Mean Flow," 13th U.S. National Congress of Applied Mechanics, June 1998, Gainesville, FL.
6. "Aerodynamic Sound Generation by Two Parallel Vortices Interpreted as Resulting from Interaction of Acoustic, Vorticity, and Entropy Fields", ASME IMECE, November 16-21, 1997, Dallas, TX. (with collaborator Allan D. Pierce).
7. "The 3D Inverse Aeroacoustic Problem," ASME IMECE, November 16-21, 1997, Dallas, TX. (presentation by collaborator Trevor Wood).
8. "The Influence of Shape on the Rayleigh Conductivity of a Wall Aperture in the Presence of Grazing Flow," ASME IMECE, November 16-21, 1997, Dallas, TX. (presentation by collaborator Kelly Horan).
9. "Nonlinear interactions of acoustic, vorticity, and entropy modes, with applications to computational aero- and hydro-acoustic," 133rd Meeting of the Acoustical Society of America, Penn State University, State College, PA, June 1997 (with collaborator Allan D. Pierce).
10. "The influence of aperture shape on Rayleigh conductivity for one-sided grazing flow," 133rd Meeting of the Acoustical Society of America, Penn State University, State College, PA, June 1997 (presentation by collaborator Trevor Wood).
11. "Two- and three-dimensional inverse aeroacoustic problems," Current and Future Direction in Applied Mathematics Symposium, The University of Notre Dame, Notre Dame, IN, April 1996.
12. "An Inverse Acoustic Problem in the Presence of a Mean Flow," 130th Meeting of the Acoustical Society of America, St. Louis, MO, November 1995 (with collaborator Hafiz M. Atassi).
13. "An Inverse Acoustic Problem in the Presence of a Mean Flow," ASME IMECE, San Francisco, CA, November 1995 (with collaborator Hafiz M. Atassi).
14. "The Flapping Airfoil and Comparison with Experiments," Navy Workshop on Airfoils in Nonuniform Flows, ND Report NO. 93-09, September 1993 (with collaborator Hafiz M. Atassi).
15. "Predicting a Vortical Disturbance from the Sound Radiated as It Interacts with a Flat Plate," Institute for Mathematics and Its Applications: Inverse Problems in Wave Propagation, University of Minnesota, March, 1995.

## GRANTS:

1. "Computational modeling of solid oxide fuel cells and other electrochemical systems," COE Dean's Catalyst, \$47,741, 5/1/09-4/31/09. Co-PI with S. Gopalan. (pending)
2. "Using CFD to Guide Rotor Wake Formulations for Fan Broadband Noise Simulations," AARC, \$91,975, 9/1/08-8/31/11. Co-PI with Doug Sondak. (pending)
3. "WIN:Women in Networks, Building Community and Gaining Voice," NSF, \$742,702, 9/1/08-8/31/11. Co-PI with Deborah Belle.
4. "Modeling the HRTF for Gerbils," BU HRC Seed Grant, \$12,170, 6/1/03-8/31/03.
5. "Effect of Blade Shape on Unsteady Response to Turbulence Ingestion," NSWC, Carderock Division, \$21,000, 11/1/00-5/30/01.

6. "An Efficient Method for Computing the Aeroacoustic Response of High-Lift System," Boeing Aircraft Corporation, \$9,617, 11/1/99-5/30/00.
7. "Aeromechanical Effect of Vane Clocking in Turbines", General Electric Aircraft Engines, \$37,000, 8/1/99-5/30/00.
8. "POWRE: Use of Conventional Computational Fluid Dynamics to Predict Sound Generated by Complex Flows," NSF, \$65,000, 7/1/98-12/30/99.
9. "Support for Undergraduate Projects in Boston University's AME Dept.," United Technologies Corporation, yearly continuation, \$32,000 since inception 11/1/96.
10. "Support for Undergraduate Projects in Boston University's AME Dept.," General Electric Aircraft Engines, \$2,000, 9/1/01.

#### **STUDENT THESES:**

- Kelly M. Horan, *The Dependence Of The Rayleigh Conductivity On The Shape Of A Wall Aperture In The Presence Of Grazing Flow*, Master of Science, Boston University, May 1998.
- Trevor H. Wood, *Inverse Aeroacoustic Problem For A Flat Rectangular Wing In A Gust*, Master of Science, Boston University, June 1998.
- Trevor H. Wood, *Aerodynamic Generated Sound by a Wing of Complex Geometry*, Ph. D., Boston University, July 2001.
- W. Gary Dewar, *Experimental Investigation of the Flow Characteristics Within a Shallow Wall Cavity for Both Laminar and Turbulent Upstream Boundary Layers*, Ph.D. Boston University, September, 2001.
- Caroline Curtis Granda, *A Computational Acoustic Prediction Method Applied to Two-Dimensional Cavity Flow*, Master's Thesis, Boston University, December, 2001.
- Franck Zagadou, *Numerical Analysis of Acoustic Scattering by a Thin Circular Disk, with Application to Train-tunnel Interaction Noise*, Master's Thesis, Boston University, Summer, 2002.
- Erika Quaranta, *Application of the Boundary Element Method to Computation of the Head-related Transfer Function for Gerbils*, Master's Thesis, Boston University, Spring, 2004.

#### **HONORS AND AWARDS:**

- AIAA Associate Fellow, 2005.
- Derek Brewer visiting faculty fellowship at Emmanuel College, Cambridge University, Lent term 2004.
- Faculty Service Award, BU COE, Spring 2002.
- AIAA National Faculty Advisor Award, January, 2001.
- Invited to be guest lecturer for the von Karman Institute Lecture Series on Aeroacoustics, 2001, 2004.
- Chosen to participate in *Achieving Success in Academia*, An Invitational Conference for Female Faculty and Graduate Students in Engineering. Hosted by the Women in Engineering Program Advocates Network (WEPAN), Washington, D.C., June, 1997.
- Invited to attend and speak at the *IUTAM Symposium on Computational Methods for Unbounded Domains*, Boulder, CO, July 1997.
- Best paper award from the Noise Control and Acoustics Division of ASME, for the submission "Predicting Unsteady Aerodynamic Parameters From Airfoil Surface Pressure Measurements," to the International Mechanical Engineering Congress and Exposition, November 1996.