

DR. MATTHEW S. ALLEN

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EDUCATION

Atlanta, Georgia **Georgia Institute of Technology** 2001 – 2005

Ph.D./M.S. in Mechanical Engineering:

- Ph.D. Thesis: “Global and Multi-Input-Multi-Output (MIMO) Extensions of the Algorithm of Mode Isolation (AMI)” **Advisor:** Dr. Jerry H. Ginsberg
- Doctorate degree received May 7, 2005.

Provo, Utah **Brigham Young University** 1994 – 95, 98 – 2001

B.S. in Mechanical Engineering: Magna Cum Laude

- Research in Vibrations, Materials Science and Heat Transfer.

RESEARCH

University of Wisconsin-Madison, Assistant Professor 2007 – present

Dr. Allen is the principal investigator on over \$870k of funded research. Major projects are listed below and some results are highlighted.

- “Metrics for Diagnosing Negative Mass in Experimental/Analytical Substructuring,” **co-PI, Sandia National Laboratories, 2010-2011, \$45,000**
- “Substructuring with Nonlinear Subcomponent Models Based on Nonlinear Normal Modes with Application to Hypersonic Vehicle Design,” **PI, Young Investigator Program, Air Force Office Of Scientific Research, Program Manager: David Stargel, 2011-2014, \$364,180**
 - Studying nonlinear vibration of assemblies of subcomponents and strategies for extracting nonlinear models from finite element codes. The project aims to facilitate the design of hypersonic vehicle skin panels.
- “Method for Experimental Identification of Nonlinear Dynamic Systems of Unknown Form and Order with Application to Human Gait,” **PI, National Science Foundation, Program Manager: Eduardo Misawa, 2010-2013, \$279,982**
 - Developing system identification technique that determines the order, model form and parameters of nonlinear dynamic systems by approximating them as linear time-periodic over a certain limit cycle.
 - These methods are being used to seek to obtain a better understanding of neuro-muscular function in human gait.
- “Develop Process to Estimate the Noise Floor of Various Torsional Vibration Sensors,” **PI, Cummins Power Generation, 2010, \$29,620**
- “Experimental/Analytical Substructuring under Uncertainty,” **co-PI, Sandia National Laboratories, 2009-2010, \$46,151**
 - Developing methods to explain the presence of non-positive definite mass matrices when substructures are uncoupled.

- “Coupling/Decoupling of Field and Laboratory Structures and Modal Substructure Expansion,” **co-PI, Sandia National Laboratories, 2008-2009, \$30,002**
 - Extended substructuring methodology to predict the fixed base modes of a structure attached to a moving, flexible support (e.g. satellite on a shaker table.)
- Continuous Scan Laser Doppler Vibrometry, Supported by University of Wisconsin-Madison Startup Funds
 - Developed algorithm that can capture vibration data hundreds of times faster than existing techniques, by extracting pseudo-Frequency Response Functions from laser vibrometer signals acquired while continuously sweeping the location of the laser spot (measurement point).
 - Exploring applications to detect damage in structures, validate complex finite element models, and characterize a structure’s response to impact events that are difficult to replicate.
- “Stochastic Analysis of Test Analysis Model (TAM) Correlation for Aircraft,” **PI, Air Force Office of Scientific Research, 2008, ~\$15k**
 - Presented a unified framework to evaluate methods of uncertainty quantification such as Polynomial Chaos Expansions (PCE), reliability methods and quasi-random sampling methods.
- “Stochastic Analysis of Test-Analysis Models,” **PI, supported by Sandia National Laboratories, 2007-2008, \$21,888**
 - Developed methodology to ascertain what level of fidelity is required in experimental measurements to obtain accurate computer models for coupled loads analysis of launch systems.
- “Characterization of Nonlinear Microsystems using Laser Doppler Vibrometer (LDV) Measurements,” **PI, Sandia National Laboratories, 2007-2008, \$26,330**
 - Discovered previously unmodeled effects that can cause atomic force microscope calibration to be in error by more than 100%. Developing approaches to correct for these errors, enabling accurate force measurement in nano-scale systems.
- “Experimental/Analytical Substructure Coupling,” **PI, Sandia National Laboratories, 2007-2008, \$21,888**
 - Enabled more accurate and efficient modeling of structures composed of subsystems by developing an alternative method of connecting subcomponent models that reduces the sensitivity of coupled system predictions to experimental errors.
 - This work enabled us to predict the response of a complicated structure made up of subcomponents that join through a statically indeterminate multi-point connection.

Sandia National Laboratories, Postdoctoral Appointee

2005 – 2006

- Nonlinear Vibration
 - Developed method to characterize nonlinear response of micro-cantilevers to support squeeze film damping modeling efforts.
 - Investigated time-domain methods for detecting nonlinearity in transient (shock) response data.

- Uncertainty Quantification and Model Validation
 - Optimized control waveforms for radio-frequency micro-electro mechanical switches with uncertain physical parameters.
 - Developed methods for modeling the response of nonlinear dynamic systems to nonstationary, non-Gaussian input.
 - Evaluated techniques for modeling dynamic systems with stochastic parameters using finite element models. Methods studied include Latin Hypercube Sampling, reliability methods (FORM/SORM) and stochastic finite elements. (Joint effort with Lockheed Martin)
 - Explored new methods for validating models in the presence of variability, ignorance, and incomplete information.
- Force Reconstruction and Admittance Modeling
 - Developed new time domain methods for identifying the forces acting on a structure from response measurements. Compared these and existing methods to classical frequency domain techniques.
 - Characterized uncertainty and experimental issues in admittance modeling for automobiles. Joint project between SNL and Goodyear.

Georgia Institute of Technology

2001 – 2005

- Experimental Modal Analysis (EMA), Vibrations
 - Created a global Multi-Input-Multi-Output (MIMO) extension to the Algorithm of Mode Isolation (AMI). The resulting algorithm estimates the natural frequencies, damping ratios and mode shapes of vibratory systems from experimentally measured vibration data in the presence of significant measurement noise, as may be present in damage detection or condition monitoring applications.
 - Applied AMI algorithms to detect damage and manufacturing defects in computer chips (“flip-chips”) and timber highway-bridge pilings.
 - Incorporated concepts from nonlinear optimization into MIMO-AMI. Careful attention to computational efficiency resulted in an algorithm that is capable of quickly processing data from hundreds of input – output combinations simultaneously.
 - Investigated systems with close natural frequencies, mode localization and high noise and applied knowledge of the vibratory phenomena to algorithm development.
 - Studied and applied advanced signal processing and statistical concepts such as bias error in spectral and frequency response function estimation, confidence intervals, etc...
- Controls, Dynamic Systems
 - Implemented modern system identification algorithms such as the Stochastic Subspace (SSI) and pLSCF (or Polymax®) algorithms and found the extensions of AMI to compare favorably with these.

Patterned Fiber Composites, Lindon, UT

2000 – 2001

- Testing of Composite Materials, Design of Composite Structures, Finite Element Analysis (FEA), Damping, Vibrations

- Found that time-temperature superposition could be applied to damped wavy composite materials and implemented frequency/temperature testing, greatly increasing our understanding of how wavy composite materials perform.
- Helped in developing a novel dynamic testing apparatus with temperature control for carbon-fiber composite materials that exhibit extremely high damping.
- Designed highly damped composites for aerospace and sporting goods applications. (See our golf club at www.nr-golf.com. The “Wright Flyer” replica airplane, featured on the Discovery Channel, also used these materials <http://wrightflyer.usurf.usu.edu/>)
- Performed FEA simulations and correlated FEA results to test data.
- Designed structural modifications to manufacturing equipment.

Center for Advanced Friction Studies, Carbondale, IL

Summer 1999

- Materials Science: Carbon/Carbon Composites, Heat Transfer
 - Worked in research of Carbon/Carbon fiber composites graphitized using a chemical vapor deposition technique (CVD) for use as friction materials in aircraft braking systems.
 - Collected thermal property data and improved existing thermal modeling software to better correlate the results and evaluate the system design.
 - Used scanning electron microscopy (SEM) as well as optical microscopy to analyze carbon fiber microstructure and friction film.

TEACHING

University of Wisconsin-Madison

2007 – present

- Vibrations of Mechanical Systems (EMA/EP/ME 545)
 - Vibrations of linear single and multi-degree of freedom systems, Lagrange’s equations, modal analysis, Ritz method for continuous systems, etc...
 - Text: “Mechanical and Structural Vibrations,” Jerry H. Ginsberg, 2001.
- Experimental Vibrations (EMA/ME 540)
 - Junior-Senior level course concerned with experimental techniques for dynamic systems including experimental modal analysis, operational modal analysis, vibration sensors (e.g. accelerometers, strain gauges, etc...)
- Advanced Dynamics (EMA/ME 542)
 - Junior-Senior level course covering 3D rigid body dynamics including Moving/Rotating reference frames, Euler’s equations, etc...
 - Text: “Advanced Dynamics,” 3rd ed. Jerry H. Ginsberg, 2008.
- Nano-Mechanics (EMA 615) co-taught with Prof. Wendy Crone.
 - Applications of mechanics and materials to nanoscale and MEMS systems
 - Taught modules on Atomic Force Microscopy (AFM), uncertainty analysis in MEMS, dynamics applications and thermal vibration in MEMS and AFM.

AWARDS RECEIVED

- ASEE/AFOSR Summer Faculty Research Associate, WPAFB, 2008.

- National Science Foundation (NSF) Graduate Research Fellowship – 2002
- Best Student Paper Award, 148th Meeting of the Acoustical Society of America, 2004.
- Achievement Rewards for College Scientists (ARCS) Fellowship – 2003
- Georgia Tech George W. Woodruff Fellowship – 2001
- Georgia Tech Presidential Fellowship – 2001
- Academic Scholarship from Brigham Young University – 1998
- Elected to Tau Beta Pi, Phi Kappa Phi & Golden Key Honor Societies.
- Eagle Scout Award from the Boy Scouts of America – 1993

PROFESSIONAL ASSOCIATIONS

- Society for Experimental Mechanics (SEM)
- American Society of Mechanical Engineers (ASME)
- American Institute of Astronautics and Aeronautics (AIAA)
- Acoustical Society of America (ASA)

CITIZENSHIP / SECURITY CLEARANCE

- Citizenship: United States Citizen (USA)
- Previously held Department of Energy (DOE) Q-clearance

PUBLICATIONS: [HTTP://SILVER.NEEP.WISC.EDU/~MSALLEN/](http://silver.neep.wisc.edu/~msallen/)

Refereed Journal Papers

- M.W. Sracic and M. S. allen, “Numerical Continuation of Periodic Orbits for Harmonically Forced Nonlinear Systems,” Mechanical Systems and Signal Processing, (Submitted Feb. 2011).
- H. Frentrup and M. S. Allen, “Error in Calibration of Atomic Force Microscope Probes Due to Nonuniform Cantilevers,” Nanotechnology, (Submitted Feb. 2011).
- M. S. Allen and R. L. Mayes, “Experimental Modal Substructuring to Estimate Fixed-Base Modes from Tests on a Flexible Fixture,” Journal of Sound and Vibration, (Submitted Nov. 2010).
- M. W. Sracic and M. S. Allen, “Method for Identifying Models of Nonlinear Systems Using Linear Time Periodic Approximations,” Mechanical Systems and Signal Processing, (Submitted Oct. 2010).
- M. S. Allen, M. W. Sracic, S. Chauhan, and M. H. Hansen, “Output-Only Modal Analysis of Linear Time Periodic Systems with Application to Wind Turbine Simulation Data,” Mechanical Systems and Signal Processing, (Accepted Dec. 2010).
- S. Yang, M. W. Sracic, and M. S. Allen, “Two algorithms for mass normalizing mode shapes from impact excited continuous-scan laser Doppler vibrometry,” Journal of Vibration and Acoustics, (Submitted Aug 2010).
- M. S. Allen & R. L. Mayes, “Estimating the Degree of Nonlinearity in Transient Responses with Zeroed Early-Time Fast Fourier Transforms,” Mechanical Systems and Signal Processing, (available online Mar. 2010), <http://dx.doi.org/10.1016/j.ymsp.2010.02.012>
- M. S. Allen, R. L. Mayes, and E. J. Bergman, “Experimental Modal Substructuring to Couple and Uncouple Substructures with Flexible Fixtures and Multi-point Connections,” Journal of Sound and Vibration, vol. 329, pp. 4891–4906, 2010, <http://dx.doi.org/10.1016/j.jsv.2010.06.007>.

- M.S. Allen & M.W. Sracic, "A New Method for Processing Impact Excited Continuous-Scan Laser Doppler Vibrometer Measurements," *Mechanical Systems and Signal Processing*, vol. 24, pp. 721–735, 2010, doi:10.1016/j.ymsp.2009.11.004.
- E. J. Bergman, M. S. Allen, D. C. Kammer, and R. L. Mayes, "Probabilistic Investigation of Sensitivities of Advanced Test-Analysis Model Correlation Methods," *Journal of Sound and Vibration*, vol. 329, pp. 2516–2531, 2010, <http://dx.doi.org/10.1016/j.jsv.2010.01.009>.
- M. S. Allen, H. Sumali, and P. C. Penegor, "Experimental/Analytical Evaluation of the Effect of Tip Mass on Atomic Force Microscope Calibration," *ASME Journal of Dynamic Systems, Measurement and Control*, vol. 131, p. 064501 (10 pp.), 2009.
- M. S. Allen "Frequency-Domain Identification of Linear Time-Periodic Systems using LTI Techniques," *Journal of Computational and Nonlinear Dynamics*, Oct. 2009, Vol. 4, 041004-1, DOI: 10.1115/1.3187151
- D. S. Erdahl, M. S. Allen, C. Ume and J. H. Ginsberg, "Structural Modal Analysis for Detecting Open Solder Bumps on Flip Chips," *IEEE Transactions on Advanced Packaging*, vol. 31, pp. 118-126, February 2008.
- M. S. Allen, H. Sumali & D. S. Epp, "Piecewise-linear Restoring Force Surfaces for Semi- Nonparametric Identification of Nonlinear Systems," *Nonlinear Dynamics*, vol. 54, no. 1-2, October, 2008. DOI 10.1007/s11071-007-9254-x
- M. S. Allen and T. G. Carne, "Comparison of Inverse Structural Filter (ISF) and Sum of Weighted Accelerations (SWAT) Time Domain Force Identification Methods," *Mechanical Systems and Signal Processing*, vol. 22, pp. 1036–1054, 2008.
- M. S. Allen, J. E. Massad, R. V. Field, Jr. and C. W. Dyck, "Input and Design Optimization Under Uncertainty to Minimize Impact Velocity of an Electrostatically-Actuated MEMS Switch," *Journal of Vibration and Acoustics*, vol. 130, p. 021009, 2008.
- M. S. Allen and J. H. Ginsberg, "A Global, Single-Input-Multi-Output (SIMO) Implementation of the Algorithm of Mode Isolation and Applications to Analytical and Experimental Data," *Mechanical Systems and Signal Processing*, vol 20, 2006, pp. 1090-1111.
- J. H. Ginsberg and M. S. Allen, "A Linear Least-Squares Version of the Algorithm of Mode Isolation for Identifying Modal Properties, Part I: Conceptual Development," *Journal of the Acoustical Society of America*, vol. 116, no. 2, August 2004, pp. 900-907.
- M. S. Allen and J. H. Ginsberg, "A Linear Least-Squares Version of the Algorithm of Mode Isolation for Identifying Modal Properties, Part II: Application and Assessment," *Journal of the Acoustical Society of America*, vol. 116, no. 2, August 2004, pp. 908-915.

Refereed Conference Papers

- M. S. Allen & M. W. Sracic, "System Identification of Dynamic Systems with Cubic Nonlinearities Using Linear Time-Periodic Approximations," ASME 2009 International Design Engineering Technical Conference IDETC, San Diego, California, Aug. 30-Sept. 2, 2009.
- M. S. Allen & D. M. Aguilar, "Model Validation of a Bolted Beam Using Spatially Detailed Mode Shapes Measured by Continuous-Scan Laser Doppler Vibrometry," 50th AIAA Structures, Structural Dynamics, and Materials Conference, Palm Springs,

California, May 4-7, 2009.

- M. S. Allen & J. A. Camberos, "Comparison of Uncertainty Propagation / Response Surface Techniques for Two Aeroelastic Systems," 50th AIAA Structures, Structural Dynamics, and Materials Conference, Palm Springs, California, May 4-7, 2009.
- E. J. Bergman, M. S. Allen, and R. L. Mayes, "Sensitivity of Two Component Mode Synthesis Methods Applied to Addition and Subtraction of Substructures," in 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference Schaumburg, IL, 2008.
- M. S. Allen, "Floquet Experimental Modal Analysis for System Identification of Linear Time-Periodic Systems," ASME 2007 International Design Engineering Technical Conferences, IDETC/CIE 2007, Las Vegas, Nevada, USA, Sept. 4-7, 2007.
- M. S. Allen, H. Sumali & D. S. Epp, "Restoring Force Surface Analysis of Nonlinear Vibration data from Micro-Cantilever Beams," presented at 2006 ASME Congress in Chicago, IL, November 2006.
- M. S. Allen, J. E. Massad, and R. V. Field, Jr. "Modeling and input optimization under uncertainty for a collection of RF MEMS devices," presented at 2006 ASME Congress in Chicago, IL, November 2006.
- M. S. Allen and T. G. Carne, "Comparison of Inverse Structural Filter (ISF) and Sum of Weighted Accelerations (SWAT) Time Domain Force Identification Methods," presented at the 47th AIAA-ASME-ASCE-AHS-ASC Structures, Structural Dynamics, and Materials Conference, Newport, Rhode Island, May 2006.

Submitted Conference Papers

- R. L. Mayes and M. S. Allen, "Converting a Driven Base Vibration Test to a Fixed Base Modal Analysis " in 29th International Modal Analysis Conference (IMAC XXIX) Jacksonville, Florida, 2011.
- M. W. Sracic and M. S. Allen, "Identifying parameters of nonlinear structural dynamic systems using linear time-periodic approximations," in 29th International Modal Analysis Conference (IMAC XXIX) Jacksonville, Florida, 2011.
- M. W. Sracic and M. S. Allen, "Numerical Continuation of Periodic Orbits for Harmonically Forced Nonlinear Systems" in 29th International Modal Analysis Conference (IMAC XXIX) Jacksonville, Florida, 2011.
- S. Yang and M. S. Allen, "Output-Only Modal Analysis Using Continuous-Scan Laser Doppler Vibrometry and Application to a 20kW Wind Turbine," 29th International Modal Analysis Conference (IMAC XXIX) Jacksonville, Florida, 2011.
- M. S. Allen, S. Chauhan, and M. H. Hansen, "Advanced Operational Modal Analysis Methods for Linear Time Periodic System Identification," in 29th International Modal Analysis Conference (IMAC XXIX) Jacksonville, Florida, 2011.
- M. S. Allen, D. C. Kammer, and R. L. Mayes, "Metrics for Diagnosing Negative Mass and Stiffness when Uncoupling Experimental and Analytical Substructures," in 29th International Modal Analysis Conference (IMAC XXIX) Jacksonville, Florida, 2011.
- M. S. Allen, D. C. Kammer, and R. L. Mayes, "Uncertainty in Experimental / Analytical Substructuring Predictions: A Review with Illustrative Examples," International Seminar on Modal Analysis (ISMA), Leuven, Belgium, Sept. 20-22, 2010.
- A. Gasparoni, M. S. Allen, S. Yang, M. W. Sracic, P. Castellini & E. P. Tomasini,

“Experimental Modal Analysis on a Rotating Fan Using Tracking-CSLDV,” in 9th International Conference on Vibration Measurements by Laser Techniques, Ancona, Italy, 2010.

- M. S. Allen, H. M. Gindlin & R. L. Mayes, “Experimental Modal Substructuring to Extract Fixed-Base Modes from a Substructure Attached to a Flexible Fixture,” 28th International Modal Analysis Conference (IMAC XXVIII), Jacksonville, Florida, Feb. 1-4, 2010.
- H. Frentrup & M. S. Allen, “Error quantification in calibration of AFM probes due to non-uniform cantilevers,” 28th International Modal Analysis Conference (IMAC XXVIII), Jacksonville, Florida, Feb. 1-4, 2010.
- M. S. Allen, M. W. Sracic, S. Chauhan & M. H. Morten, “Output-Only Modal Analysis of Linear Time Periodic Systems with Application to Wind Turbine Simulation Data,” 28th International Modal Analysis Conference (IMAC XXVIII), Jacksonville, Florida, Feb. 1-4, 2010.
- M. S. Allen, H. Sumali, and P. C. Penegor, “Effect of Tip Mass on Atomic Force Microscope Calibration by Thermal Tune Method,” in 27th International Modal Analysis Conference (IMAC XXVII), Orlando, Florida, Feb. 2009.
- M. W. Sracic & M. S. Allen, “Experimental Investigation of the Effect of Speckle Noise on Continuous Scan Laser Doppler Vibrometer Measurements,” in 27th International Modal Analysis Conference (IMAC XXVII), Orlando, Florida, Feb. 2009.
- M. S. Allen & R. L. Mayes, “Estimating the Degree of Nonlinearity in Transient Responses with Zeroed Early-time Fast Fourier Transforms,” in 27th International Modal Analysis Conference (IMAC XXVII), Orlando, Florida, Feb. 2009.
- M. S. Allen & S. A. Miller, “Effect of Model Order Ambiguity in Experimental Modal Analysis on Substructuring Predictions,” in 27th International Modal Analysis Conference (IMAC XXVII), Orlando, Florida, Feb. 2009.
- M. S. Allen and M. W. Sracic, "Mass Normalized Mode Shapes Using Impact Excitation and Continuous-Scan Laser Doppler Vibrometry," in 8th International Conference on Vibration Measurements by Laser Techniques, Ancona, Italy, 2008, pp. 7098-3.
- M. S. Allen & M. W. Sracic, “A Method for Generating Pseudo Single-Point FRFs from Continuous Scan Laser Vibrometer Measurements,” 26th International Modal Analysis Conference (IMAC XXVI), Orlando, Florida, Feb. 2008.
- E. J. Bergman, M. S. Allen, D. C. Kammer & R. L. Mayes, “Probabilistic Investigation of Sensitivities of Advanced Test-Analysis Model Correlation Methods,” 26th International Modal Analysis Conference (IMAC XXVI), Orlando, Florida, Feb. 2008.
- M. S. Allen, H. Sumali & E. B. Locke, “Experimental/Analytical Evaluation of the Effect of Tip Mass on Atomic Force Microscope Calibration,” 26th International Modal Analysis Conference (IMAC XXVI), Orlando, Florida, Feb. 2008.
- R. L. Mayes, P. S. Hunter, T. W. Simmermacher & M. S. Allen, “Combining Experimental and Analytical Substructures with Multiple Connections,” 26th International Modal Analysis Conference (IMAC XXVI), Orlando, Florida, Feb. 2008.

- M. S. Allen & R. L. Mayes, "Comparison of FRF and Modal Methods for Combining Experimental and Analytical Substructures," 25th International Modal Analysis Conference (IMAC XXV), Orlando, Florida, Feb. 2007.
- M. S. Allen and J. H. Ginsberg, "Floquet Modal Analysis to Detect Cracks in a Rotating Shaft on Anisotropic Supports," 24th International Modal Analysis Conference (IMAC XXIV), St. Louis Missouri, Feb. 2006.
- M. S. Allen and J. H. Ginsberg, "Global, Hybrid, MIMO Implementation of the Algorithm of Mode Isolation," 23rd International Modal Analysis Conference (IMAC XXIII), Orlando, Florida, 2005.
- M. S. Allen, J. H. Ginsberg, and A. Ferri, "Modal Identification of the Z24 Bridge Using MIMO-AMI," 23rd International Modal Analysis Conference (IMAC XXIII), Orlando, Florida, 2005.
- M. S. Allen and J. H. Ginsberg, "SIMO Extension of the Algorithm of Mode Isolation," presented at the 22nd International Modal Analysis Conference (IMAC XXII), Dearborn, Michigan, 2004.
- J. H. Ginsberg and M. S. Allen, "Recent Improvements of the Algorithm of Mode Isolation," presented at Proceedings of IMECE'03, ASME International Mechanical Engineering Congress and Exposition, NCA, Washington, DC, 2003.
- M. S. Allen, C. Moloney, J. H. Ginsberg, and A. Ferri, "Comparison of a Linear Least Squares Algorithm and STAR Modal for a Square Elastic Plate," presented at the 21st International Modal Analysis Conference (IMAC XXI), Orlando, Florida, 2003.
- J. H. Ginsberg, M. S. Allen, A. Ferri, and C. Moloney, "A General Linear Least Squares SDOF Algorithm for Identifying Eigenvalues and Residues," presented at the 21st International Modal Analysis Conference (IMAC XXI), Orlando, Florida, 2003.
- W. F. Pratt, S. Sommerfeldt and M. Allen, "Testing Wavy Composites," Science of Advanced Materials and Process Engineering Series, 45, Book 1, 216-228, 2001.
- W. F. Pratt, M. Allen and C. G. Jensen, "Designing with Wavy Composites," Science of Advanced Materials and Process Engineering Series, 45, Book 1, 203-215, 2001.
- W. F. Pratt and M. S. Allen, "Characterization and Finite Element Model Correlation of Wavy Composites," 33rd International SAMPE Technical Conference, Seattle, WA, 2001.
- W. F. Pratt and M. S. Allen, "Testing and Characterization of Highly Damped Structural Materials," 33rd International SAMPE Technical Conference, Seattle, WA, (2001).

AFRL Final Report – *Testing / Analysis of Carbon Fiber Composites*

- W. F. Pratt, M. S. Allen and T. J. Skousen, "Highly Damped Lightweight Wavy Composites," AFRL-VS-TR-2001, Phillips Air Force Research Laboratory, Kirkland AFB, NM, 2001.

Invited Presentations

- "From Lasers to Wind Turbines: Frequency-Domain System Identification for Linear Time-Periodic Systems", Rheology Research Center, University of Wisconsin-Madison, 2009.
- "Accelerated Vibration Testing using Continuous-Scan Laser Doppler Vibrometry (CSLDV)," WARF First Look Forum, April, 2009.
- "System Identification and Uncertainty in Dynamic Systems", College of Engineering, Marquette University, Milwaukee, WI, September 2008.
- "A Multi-Input-Multi-Output (MIMO) Version of the Algorithm of Mode Isolation (AMI)," presented at the 150th Meeting of the Acoustical Society of America,

Minneapolis, Minnesota, October 2005.

Presentations

- M. S. Allen, D. M. Aguilar, M. W. Sracic & S. Yang, “2D Continuous-Scan Laser Doppler Vibrometry Applied to Condenser Fan,” 158th Meeting of the Acoustical Society of America, San Antonio, Texas, Oct. 2009.
- M. S. Allen and J. H. Ginsberg, “On the Accuracy of Modal Parameters Identified from Exponentially Windowed, Noise Contaminated Impulse Responses for a System with a Large Range of Decay Constants.” 148th Meeting of the Acoustical Society of America, San Diego, California, Nov. 2004. Received the “Best Student Paper Award.”

EXTRACURRICULAR / SERVICE ACTIVITIES

- Fluent in Spanish.
- Served a two-year, full-time mission in Guatemala, Central America. Taught religious and life principles and developed a strong appreciation for Latin American culture.
- Enthusiastic skier, tennis player and photographer. Also enjoy editing home videos and playing the piano.