

Brian J Wisner

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EDUCATION

September 2017	Doctor of Philosophy in Mechanical Engineering, Drexel University Current GPA: 3.6 Dissertation: Damage Precursor Identification via Microstructure-Sensitive Nondestructive Evaluation
June 2013	Master of Science in Mechanical Engineering, Drexel University GPA: 3.6
May 2011	Bachelor of Science in Mechanical Engineering, Widener University Bachelor of Science in Physics, Widener University Cumulative GPA: 3.8 Senior Project: 2011 Aero Design Competition Certificate of Honors in General Education Fundamentals of Engineering (FE) Exam, Passed October 2010

TEACHING ACTIVITIES

Visiting Assistant Teaching Professor , Drexel University	August 2013 – Present
Courses: MEM 593 Applied Engineering Analytical & Numerical Methods III	
<ul style="list-style-type: none">• Complex analysis is introduced to students.• Probabilistic analysis is introduced to students with a focus on application to engineering systems.	
MEM 331 Experimental Mechanics	
<ul style="list-style-type: none">• Introduces students to Experimental Mechanics approaches with a focus on “hands on” learning• Students learn to use standards for conducting experiments as well as how to write technical reports of their findings connecting theory to practice.	
Adjunct Faculty , Widener University	August 2013 – December 2014
Courses: ENGR 111 Introduction to Engineering	
<ul style="list-style-type: none">• Introduced students to basic engineering concepts.• Used interdisciplinary research projects to engage students in active learning.	
ENGR 323 Mechanics of Deformable Bodies	
<ul style="list-style-type: none">• Introduced fundamental principles of Engineering, including Stress, Strain, Generalized Hooke's law, Beam Bending and Stress Transformations.• Used engineering mini-projects to apply the principles discussed to real world structures such as bridges and bike frames.	
Teaching Assistant , Drexel University	September 2011 – March 2015
Courses: ENGR 100 Beginning Computer Aided Drafting for Design	
<ul style="list-style-type: none">• Introduced students to CAD tools such as AutoCAD and ProENGINEER.• Demonstrated the use of CAD for the design processes through design project-based exams.	

MEM 202 Statics

- Led recitation sessions focused on reviewing the basic concepts of static equilibrium and vector analysis

MEM 238 Dynamics

- Led recitation sessions focused on reviewing the basic concepts of rigid body dynamic structures

MEM 331 Experimental Mechanics

- Designed and led experiments in the lab to demonstrate the concepts learned in statics, dynamics, and mechanics of materials courses.
- Instructed students how to write lab reports in a clear, concise manner consistent with journal publication rules.

RESEARCH EXPERIENCE

Research Assistant/PhD Candidate, Theoretical & Applied Mechanics Group March 2014 – Present
Lead Experimentalist, 2015- Present

Projects: **SBIR: Health Conscious Structures for Zero-Maintenance Rotorcraft Platforms**

- Perform fatigue and vibrational testing of Al and composite specimens.
- Develop Damage evolution curves for the materials to be applied to a FEM modeling framework for remaining life estimations
- Perform validation on a full size component

In situ SEM-DIC-AE NDE Technique Development

- Used a custom SEM door to pass AE signals obtained inside the SEM out for in situ SEM monitoring of the microstructure while recording the corresponding AE hits.
- Used materials with varying particle size and application methods to achieve high electrical contrast for DIC with SEM images. Methods include particle deposition and microstamping.

Damage Precursor Identification in Light Metal Alloys

- AE, DIC techniques coupled with SEM observation allow the identification of the earliest signs of damage in Al alloys, such as particle fracture and debonding.
- Strain evolution reveals the driving force of these mechanisms based on dislocation motion and strain build ups at particle sites prior to damage.
- AE classification and outlier analysis is used to identify the onset of damage, the type of damage, and help predict remaining useful life.
- Twinning in Mg alloy AZ31 is performed in the same way from single crystals to polycrystals to identify the AE signature of twinning for material state awareness.

Damage Detection and Evolution in 3D Woven Composites

- Combining ASTM Standard testing with Stereo DIC and AE monitoring to study the damage mechanisms and evolution of 3D woven composites.
- X-ray micro CT scanning was conducted to validate the information obtained from AE as indicating damage present sub surface.

Degradation of Concrete from Impingement of NaCl during Freezing Cycles

- Using a combined acoustic emission and ultrasonic testing technique, damage evolution in a concrete specimen subjected to freezing and thawing cycles while soaking in a NaCl solution is studied.

- AE is used as a structural health monitoring tool live during the loads while the ultrasonic testing is performed after thawing as a nondestructive technique to measure the level of damage in the material.

Development of a Tobacco Mosaic Virus DIC Speckle Method

- Using a naturally structured system to produce contrast for DIC, the technique of applying the pattern allows for a microscale DIC pattern to be developed over the entire specimen in a small amount of time.
- Limits include the mismatch of the virus base coat required to adhere the virus to the test material.

Student Intern, Sandia National Labs Org 1851 December 2015 – Present

Projects: **Development of a Gold Remodeled DIC Pattern for In Situ SEM Application**

- A sputter-coated nanometer thick gold film is naturally remodeled using heat and humidity to form a micro-scale DIC pattern on a large sample area in a short amount of time.
- The humidity level and time exposed as well as the gold film thickness control the scale of the DIC pattern.

Development of an SEM Distortion Correction Algorithm

- Spatial Distortion correction is performed based on a series of images captured during rigid body motions.
- Drift Distortion Correction is performed based on repeated images of the same area taken over time.

Research Assistant, MiNED September 2011 – June 2013

Projects: **Real Space Materials Knowledge System Implementation using Bayesian Statistics**

- The microstructure is selected based on the desired material properties in real space to determine the effects of the periodic boundary conditions imposed by the FFT formulation used to de-convolve time and space.
- Bayesian Updating is proposed to increase the speed and reliability of the method by using prior knowledge of the system.

Research Assistant, Army Research Labs, Aberdeen September 2012 – December 2012

Projects: **Machine Learning Algorithm for Optimum Chromophore Selection**

- Chromophore selection is driven by its application and ability to be synthesized. This project identifies the optimum chromophore based on the desired properties and identifies the top choices that can be synthesized based on clustering.

INDUSTRY EXPERIENCE

Piasecki Aircraft Corporation, Essington, Pennsylvania January 2013 – September 2015

Job Title: Mechanical Engineer and Configuration Manager

Responsibilities: Designed structural components for various projects. Created and managed a configuration control system to ensure everyone was working with the latest approved designs to obtain 9001 compliance.

Schramm Inc., West Chester, Pennsylvania January 2010 – August 2010

Job Title: Manufacturing Engineer, Co-op

Responsibilities: Developed solutions for problems arising between design and manufacturability. Designed new tooling and inspection equipment as well as new manufacturing facilities. Established work instructions for API certification.

AWARDS

- 2016 AEWG Student Paper Competition Winner
2015-2016 Kling Lindquist Partnership Engineering Fellowship
2011 The Association of Engineering Colleges of Pennsylvania Award
2010 Boeing Scholarship

COMPUTER SKILLS

SolidWorks, Microsoft Office, Matlab, AutoCAD, ProENGINEER, Abaqus, MeshLab, ARAMIS, VIC 3D

TECHNICAL SKILLS

Optical Microscope, SEM Microscope, Nanoindentation, Digital Image Correlation, Acoustic Emission

JOURNAL PUBLICATIONS

Under Review

- J5 2017 **B. Wisner** and A. Kontsos. "The Role of Particles in Fatigue of Aluminum Alloys." Submitted to *International Journal of Fatigue*.

Published

- J4. 2017 **B. Wisner** and A. Kontsos. "In Situ Monitoring of Particle Fracture in Aluminum Alloys." *Fatigue and Fracture of Engineering Materials and Structures*. Accepted August 2017.
- J3. 2017 N. Castaneda, **B. Wisner**, et al. "Investigation of the Z-binder Role in Progressive Damage of 3D Woven Composites." *Composites Part A: Applied Science and Manufacturing* (2016).
- J2. 2016 C. Mo, **B. Wisner**, M. Cabal, K. Hazeli, K.T. Ramesh, H. El Kadiri, T. Al-Samman, K.D. Molodov, D.A. Molodov, A. Kontsos. "Acoustic Emission of Deformation Twinning in Magnesium," *Materials* vol. 9, pp. 662, 2016.
- J1. 2015 **B. Wisner**, M. Cabal, P. A. Vanniamparambil, J. Hochhalter, W. P. Leser, and A. Kontsos, "In Situ Microscopic Investigation to Validate Acoustic Emission Monitoring," *Experimental Mechanics*, vol. 55, pp. 1705-1715, 2015.

CONFERENCE PROCEEDINGS

- C5. 2017 **B. Wisner** and A. Kontsos, "Fatigue Damage Precursor Identification using Nondestructive Evaluation Coupled with Electron Microscopy." In: Zehnder A. et al. (eds) *Fracture, Fatigue, Failure and Damage Evolution*, Volume 8. Conference Proceedings of the Society for Experimental Mechanics Series. Springer, Vol. 8, pp 1-8.
- C4. 2016 N.A. Castaneda, **B. Wisner**, J. Cuadra, and A. Kontsos, "Identification of 4D Damage Precursors in 3D Woven Composites." 31st American Society of Composites Conference and ASTM D30 Meeting 2016, Williamsburg VA, September 2016.
- C3. 2016 D. Christe, **B. Wisner**, J. Bhatt, and A. Kontsos, "Raising Interest in STEM Education (RISE): A Community College-University Partnership for Engaging Minorities inSTEM." American Society for Engineering Education, 26 June 2016. Conference Proceedings.

- C2. 2016 **B. Wisner**, and A. Kontsos, "Microstructure-Sensitive Acoustic Emission." Acoustic Emission Working Group. 24 May 2016. Conference Paper.
- C1. 2015 **B. Wisner**, M. Cabal, P. A. Vanniamparambil, J. Hochhalter, W. P. Leser, and A. Kontsos, "Identification of Acoustic Emission Sources Using in Situ Microscopy." Society for the Advancement of Material and Process Engineering. 18-24 May 2015. Conference Paper.

PRESENTATIONS

- P9. 2017 **B. Wisner**, K. Mazur, and A. Kontsos, "Coupling In Situ Microstructure Observation with Machine Learning Algorithms for Damage Diagnostics and Prognostics." The International Workshop on Structural Health Monitoring, 13 September 2017.
- P8. 2017 **B. Wisner** and A. Kontsos, "Fatigue Damage Precursor Identification using Nondestructive Evaluation Coupled with Electron Microscopy." The Society for Experimental Mechanics, 14 June 2017.
- P7. 2017 **B. Wisner**, K. Baxevanakis, and A. Kontsos, "The Role of Particle Fracture in Aluminum Alloys." The Minerals, Metals, and Materials Society, 28 February 2017.
- P6. 2016 **B. Wisner**, and A. Kontsos, "Microstructure-Sensitive Acoustic Emission." Acoustic Emission Working Group. 24 May 2016.
- P5. 2016 **B. Wisner**, K. Baxevanakis, R. Whitmore, S. Rajaram, and A. Kontsos, "Computationally-driven Damage in Structures from Microstructure-based Damage Mechanisms." Society of Engineering Science, 3 October 2016.
- P4. 2016 **B. Wisner** and A. Kontsos, "Microstructure-Sensitive Investigation of Aluminum 2024 damage Precursors using Acoustic Emission." The Minerals, Metals, and Materials Society, 15 February 2016.
- P3. 2015 **B. Wisner**, et. al, "Microstructure-Sensitive Investigation of Fracture using Acoustic Emission Coupled with Electron Microscopy." Society for Experimental Mechanics. 21 May 2015.
- P2. 2015 **B. Wisner**, et. al, "Microstructure-Sensitive Investigation of Fracture using Acoustic Emission Coupled with In Situ Electron Microscopy." Acoustic Emission Working Group. 13-15 May 2015.
- P1. 2015 **B. Wisner**, M. Cabal, P. A. Vanniamparambil, J. Hochhalter, W. P. Leser, and A. Kontsos, "Identification of Acoustic Emission Sources Using in Situ Microscopy." Society for the Advancement of Material and Process Engineering. 18-24 May 2015.

PROFESSIONAL ACTIVITIES

- **Conference Organizer:** *Materials Instability: Quantification, Constitutive Response, and Prediction* in TAM 2108
- **Reviewer** for ASME Journal of Engineering Materials and Technology
- **Member** of Society for Experimental Mechanics, Tau Beta Pi, American Society of Mechanical Engineers, Association for Iron and Steel Technology, American Society for Metals International, The Minerals, Metals, and Materials Society

COLLAORATORS

Hochhalter, Jacob (NASA Langley), Carroll, Jay (Sandia National Labs), Sause, Markus (Augsburg University), Cuadra, Jefferson (Lawrence Livermore National Labs)