

**MARK E. BARKEY**  
Professor  
Registered Professional Engineer  
Aerospace Engineering and Mechanics  
The University of Alabama  
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## Research Interests

Experimental and theoretical study of materials and solid mechanics, with emphasis on structural and material behavior when subjected to multiaxial cyclic loads. Research areas includes strength and durability analysis and testing of spot welded joints, multiaxial metal fatigue and multiaxial cyclic plasticity.

## Education

1993	<b>University of Illinois at Urbana-Champaign</b>
1991	Doctor of Philosophy in Theoretical & Applied Mechanics
	Master of Science in Theoretical & Applied Mechanics
1989	<b>University of Missouri at Rolla</b>
	Bachelor of Science in Engineering Mechanics
	Minor in Mathematics

## Work Experience

### Research

8/95 - present	<b>The University of Alabama</b> <ul style="list-style-type: none"><li>• Faculty, Aerospace Engineering and Mechanics--Experimental and analytical research in fatigue and structural behavior, supported by NASA, Chrysler, Ford, Sandia National Laboratories and others. Graduate and undergraduate teaching and supervision of various solid mechanics courses.</li></ul>
1/91 - 7/93	<b>University of Illinois</b> <ul style="list-style-type: none"><li>• Fracture Control Program: Graduate Research Assistant</li></ul>
8/90 - 1/93	<ul style="list-style-type: none"><li>• National Center for Supercomputing Applications: Graduate Research Assistant</li></ul>

### Teaching

8/95 - present	<b>The University of Alabama</b> <ul style="list-style-type: none"><li>• Faculty of Aerospace Engineering and Mechanics</li><li>• Adjunct Faculty, Mechanical Engineering</li></ul>
8/07 - 8/10	
1/94 - 5/94	<b>University of Illinois</b> <ul style="list-style-type: none"><li>• Visiting Assistant Professor of Mechanical and Industrial Engng.</li></ul>
8/89 - 5/93	<ul style="list-style-type: none"><li>• Teaching Assistant</li></ul>

## Industrial

- 2/08 - 5/10
- **Engineering Systems Incorporated (ESI)**  
Associate (Consultant): In-field strain gage data acquisition, mechanical testing, finite element analysis.
- 8/05 - 3/06
- **Metals and Materials Engineers (MME)**  
Practice Director, Engineering Mechanics: Finite element analysis with ABAQUS, manufacturing simulations, failure analysis, fatigue and fracture mechanics analysis, and testing. (while on sabbatical leave)
- 6/94 - 7/95
- **General Motors Corporation**  
Vehicle Systems Synthesis and Analysis: Senior Contact Engineer responsible for structural integrity and durability for vehicle chassis, frame, and components.
- 5/89 - 8/91
- Structural Life Development: Summer student intern.

## **Consulting**

Daniel Coker, Horton and Bell, Attorneys at Law, 2015-2016.

MBUSI, 2007.

Y. Kwon and Associates, 2004-2009.

Jim Walter Resources, Inc., 2004.

Registered Professional Engineer, State of Alabama, 2004-present.

Southern Company Services, 2003-2004, 2008-2010, 2012-2013.

Dr. J. Allen, J.D., 2002, 2008-2009.

LMS North America (formerly TecMath GmbH) 1997-1999.

TecMath (LMS) North America. 1996.

## **Awards and Honors**

*University of Alabama 2015 Outstanding Commitment to Teaching Award*, awarded by the University of Alabama Alumni Association. Awarded October 2015.

*2003 SAE Arch T. Colwell Merit Award*, for SAE Technical Paper 2003-01-0695. Awarded April 2005.

*Tau Beta Pi Outstanding Faculty Award* at the University of Alabama for the 2003-2004 academic year. Awarded April 2004.

*Charles Henry Ratcliff Memorial Award* for Excellence in Undergraduate Teaching at the University of Alabama during the Spring, Summer, and Fall semesters of the previous year. Awarded April 2000, 2003, 2008, 2009, 2011, 2012, 2013, 2014, 2015.

*Rated as an Excellent Teacher by Student Evaluations*, 1993 at the University of Illinois.

*University Fellowship*, 1989 the University of Illinois.

## **Other Activities**

Editorial Board for the *Journal of Failure Analysis and Prevention*, 2007-present.

Reviewer for various archival journals.

## **Department, College, and University Service**

Various AEM faculty search committees as member (2001-2012) and chair (2012).

AEM Graduate Program Director, 2001-2005.

AEM and COE Retention, Tenure, and Promotion Committees. Chair COE committee (2010).

UA Radiation Committee (2004-2015) and Radiation Safety Advisory Committee (2010-2013).

## **Membership in Professional and Honor Societies**

American Society of Mechanical Engineers (ASME).

Society of Automotive Engineers (SAE).

Society of Experimental Mechanics (SEM).

American Society of Materials (ASM).

Phi Kappa Phi Honor Society.

Phi Theta Kappa Honor Society.

Tau Beta Pi Engineering Honor Society.

## Graduate Student Thesis/Dissertations Directed

16. Chanse Appling, M.S. Engineering Science and Mechanics, The University of Alabama, December 2015. Thesis: “Water Quench Thermal Fatigue Analysis of Grade P22 and P91 Steels.”
15. David Metz, Ph.D. Engineering Science and Mechanics, The University of Alabama, May 2013. Dissertation: “Fatigue Characterization of Friction Plug Welds.”
14. Eric Weishaupt, Ph.D. Engineering Science and Mechanics, The University of Alabama, May 2012. Dissertation: “Spot Welding of Advanced High Strength Sheet Steel.”
13. Karla Renee Horton, Ph.D. Interdisciplinary Studies, The University of Alabama, August 2011. Dissertation: “Microhardness, Strength and Strain Field Characterization of Self-Reacting Friction Stir and Plug Welds of Dissimilar Aluminum Alloys.”
12. Rahul Vadakke Veetil, M.S. Aerospace Engineering, The University of Alabama, August 2011. Thesis: “Analysis of Beveled Semi Elliptical Surface Cracks in Friction Stir Welded Plates made of Al-2195 Alloy.”
11. Avinash Reddy Tadi, M.S. Aerospace Engineering, The University of Alabama, May 2011. Thesis: “A Finite Element Analysis of a Boa Constrictor Skull and the Design of a Jaw Bone Transducer.”
10. Zhiyi Cao, M.S. Engineering Science and Mechanics, The University of Alabama, August 2010. Thesis: “Investigation of Taylor Impact Test of Isotropic and Anisotropic Material Through Geometrical Characteristics of Specimens.”
9. Brian Stoltz, M.S. Engineering Science and Mechanics, The University of Alabama, December 2008. Thesis: “Determination of Stress Intensity Factory for Corner Cracked Square Tubes.”
8. Varun Nare, M.S. Aerospace Engineering, The University of Alabama, December 2007. Thesis: “Eigen-Buckling Analysis of Stiffened Conical Shells.” Selected as Outstanding Thesis for the College of Engineering, 2008-2009.
7. Xin Zhang, Ph.D. Engineering Science and Mechanics, The University of Alabama, August 2007. Dissertation: “Strength Testing and Analysis of Multiply Spot Welded Joints.”
6. Guoqing Wang, Ph.D. Engineering Science and Mechanics, The University of Alabama, August 2005. Dissertation: “Durability and Dynamic Response Characteristics of Tensile-Shear Spot Welded Joints.”
5. Surya P. Chodimella, M.S. Engineering Science and Mechanics, The University of Alabama, May 2004. Thesis: “Development of a Novel Technique for the Determination of Impact Strength of Spot Welded Joints.”
4. Han Jibin, M.S. Engineering Science and Mechanics, The University of Alabama, December 2001. Thesis: “Fatigue Analysis of Spot Welds Subjected to Variable Amplitude Combined Loading.”

3. Nandeesh Madapadi, M.S. Engineering Science and Mechanics, The University of Alabama, August 2001. Thesis: "A Numerical Study of Ratchetting at a Stress Concentration."
2. Hong-Tae Kang, Ph.D. Engineering Science and Mechanics, The University of Alabama, December 1999. Dissertation: "Fatigue Analysis of Spot Welds Subjected to Combined Tension and Shear Loading."
1. Haiyang Wang, Ph.D. Engineering Science and Mechanics, The University of Alabama, December 1998. Dissertation: "Multiaxial Nonlinear Kinematic Hardening and Softening in Strain Space."

## **Courses Taught**

*Undergraduate:*  
(3 total)  
Mechanics of Materials  
Mechanics of Materials Lab  
Processing and Structure of Materials

*Graduate:*  
(8 total)  
Fatigue Analysis  
Theory of Elasticity  
Theory of Plasticity  
Intermediate Solid Mechanics  
Engineering Fracture Mechanics  
Applied Finite Element Analysis  
Introduction to Experimental Mechanics  
Finite Element Method in Engineering Mechanics

Student Evaluations of Teaching: Typically between 4.5-5.0 on a scale of 1-5, with class sizes ranging from 5-150.

## Books and Monographs

Metal Fatigue Analysis Handbook, By Y. Lee, M. E. Barkey, and H. Kang. Butterworth-Heinemann/Elsevier, 2012.

Fatigue Testing, Analysis, and Design: Theory and Applications, By Y. Lee, R. Hathaway, J. Pan, and M. E. Barkey. Elsevier Science, 2004.

## Book Chapters

**Spot Weld Fatigue** by M. E. Barkey and S. Zhang, a chapter in Fatigue Testing, Analysis, and Design: Theory and Applications, 2004.

**Development of Accelerated Life Test Criteria** by Y. Lee and M. E. Barkey, a chapter in Fatigue Testing, Analysis, and Design: Theory and Applications, 2004.

**Stress-Based Uniaxial Fatigue Analysis**, Yung-Li Lee and Mark E. Barkey. Chapter 4: Metal Fatigue Analysis Handbook: Practical Problem-Solving Techniques for Computer-Aided Engineering, by Yung-Li Lee, Mark E. Barkey, and Hong-Tae Kang, Butterworth Heinemann, 2012.

**Stress-Based Multiaxial Fatigue Analysis**, Yung-Li Lee and Mark E. Barkey. Chapter 5: Metal Fatigue Analysis Handbook: Practical Problem-Solving Techniques for Computer-Aided Engineering, by Yung-Li Lee, Mark E. Barkey, and Hong-Tae Kang, Butterworth Heinemann, 2012.

**Strain-Based Uniaxial Fatigue Analysis**, Yung-Li Lee and Mark E. Barkey. Chapter 6: Metal Fatigue Analysis Handbook: Practical Problem-Solving Techniques for Computer-Aided Engineering, by Yung-Li Lee, Mark E. Barkey, and Hong-Tae Kang, Butterworth Heinemann, 2012.

**Fundamentals of Cyclic Plasticity Theories**, Yung-Li Lee and Mark E. Barkey. Chapter 7: Metal Fatigue Analysis Handbook: Practical Problem-Solving Techniques for Computer-Aided Engineering, by Yung-Li Lee, Mark E. Barkey, and Hong-Tae Kang, Butterworth Heinemann, 2012.

**Strain-Based Multiaxial Fatigue Analysis**, Mark E. Barkey and Yung-Li Lee. Chapter 8: Metal Fatigue Analysis Handbook: Practical Problem-Solving Techniques for Computer-Aided Engineering, by Yung-Li Lee, Mark E. Barkey, and Hong-Tae Kang, Butterworth Heinemann, 2012.

## Refereed Journal Articles

43. H.M. Rao, J.B. Jordon, B. Ghaffari, X. Su, A.K. Khoshrovaneh, M.E. Barkey, W. Yuan, and M. Guo, "Fatigue and Fracture of Friction Stir Linear Welded Dissimilar Aluminum-to-Magnesium Alloys," *International Journal of Fatigue*, 82 (2016) 737-747.
42. X. Liu, D. Shang, L. Zhang, Y-B. Guo, Y Sun, T. Chen. Y. Guo, and, M. E. Barkey, "Equivalent damage-healing approach to residual fatigue life prediction for copper film by laser repair," *International Journal of Damage Mechanics*, 750-766, Volume 24(5), July 2015.
41. G. Sun, F. Sun, F. Cao, S. Chen and M.E. Barkey, "Numerical Simulation of Tension Properties for Al-Cu Alloy Friction Stir-Welded Joints with GTN Damage Model," *Journal of Materials Engineering and Performance*, JMEPEF (2015) 24: 4358:4363.
40. W. Li, Y.B., Guo, M.E. Barkey, and J.B. Jordon, "Effect of Tool Wear on Surface Integrity and Fatigue Life of In 718 by End Milling," *Procedia CIRP* 14 (2014) 546-551.
39. S. Torkamani, S. Roy, E. Sazonov, M. E. Barkey, S. Burkett, S. Kotru, "A Novel Damage Index for Damage Identification in Laminated Composites Using Guided Waves," *Smart Materials and Structures*, 23 (2014) doi:10.1088/0964-1726/23/9/095015.
38. X. Liu, D. Shang, L. Zhang, M. Li, J. Jon, T. Chen. Y. Guo, and, M. E. Barkey, "A Unified Damage-Healing Model for Laser Shock Repair of Copper Film," *International Journal of Fatigue*, 145-153, Volume 63, June 2014.
37. H. Rao, R. I. Rodriguez, J. B. Jordon, M. E. Barkey, Y. B. Guo, H. Badarinarayan, and W. Yuan, "Friction stir spot welding of rear-earth ZEK100 magnesium alloy sheets," *Materials and Design* Vol. 56, pp. 750-754, 2014.
36. X. Liu, D. Shang, M. Li, J. Jin, T. Chen, Y. B. Guo and M. E. Barkey, "Healing Fatigue Damage by Laser Shock Peening for Copper Film," *International Journal of Fatigue*, 54 (2013) pp. 127-132.
35. H. Rao, B. Jordon, M. E. Barkey, Y. B. Guo, Xuming Su, and H. Badarinarayan, "Influence of Structural Integrity on Fatigue Behavior of Friction Stir Spot Welded AZ31 Mg Alloy," *Material Science and Engineering A* Vol. 564, pp. 369-380, March 2013.
34. A. Brammer, J. B. Jordon, P. G. Allison, and M. E. Barkey "Strain-Controlled Low Cycle Fatigue Properties of Extruded 6061-T6 Aluminum Alloy," *ASM Journal of Materials Engineering and Performance*, Vol 22(65) pp. 1348-1350, May 2013.
33. D. Metz and M. E. Barkey, "Fatigue Behavior of Friction Plug Welds in 2195 AL-Li Alloy," *International Journal of Fatigue*, vol 43 (2012) pp. 178-187.
32. D. Metz, E. R. Weishaupt, M. E. Barkey, B. S. Fairbee, "A Microstructure and Microhardness Characterization of a Friction Plug Weld in Friction Stir Welded 2195 Al-Li," *ASME Journal of Engineering Materials and Technology*, Vol. 134, paper 021005 pp. 1-7 April 2012.



31. T. Sasaki, M. E. Barkey, G. Thompson, Y. Syarif, D. Fox, "Microstructural Evolution of Copper Clad Steel Bimetallic Wire," *Materials Science and Engineering: A*, 228 (2011) pp. 2974-2981, 2011.
30. X. Zhang, M. E. Barkey, Y. Lee, M. Lu, E. Pakalnins, C. Orsette, W. Trojanowski, "DOE Analysis of Factors Affecting Ultimate Strength of Multiple Resistance Spot Welded Joints," *SAE Technical Paper 2007-01-1661* in the SAE 2007 Transactions Journal of Materials and Manufacturing pp. 648-656, March 2008.
29. M. E. Stevenson, M. E. Barkey, J. McDougall, E. R. Weishaupt "Failure Analysis of a Temporary Power Line Anchor," *ASM Journal of Failure Analysis and Prevention*, 8:275-280 2008.
28. M. E. Barkey, M. C. Turgeon, and T. Varun Nare, "Buckling of Stiffened Thin-Walled Truncated Cones Subjected to External Pressure" *Experimental Mechanics*, 48:281-291, 2008.
27. S.C. Ammula, Y.B. Guo, and M.E. Barkey, "A Wet Etching Method Coupled with Finite Element Analysis-Based Compliance Function to Determine Residual Stress by High Speed Milling," *ASME Journal of Manufacturing Science and Engineering*, Volume 128, pp. 792-801, August 2006.
26. G. Wang and M. E. Barkey "Investigation of Spot Weld Fatigue Crack Growth Process Using X-ray Imaging," *AWS Welding Journal Research Supplement*, Volume 85, No. 4, pp. 84s-90s, April 2006.
25. E. Amrock, M. E. Barkey, and M. C. Turgeon "Pressure Testing of Recyclable Transmission Lines for a Fusion Reactor," *Experimental Techniques*, Vol. 30, No. 1, pp. 51-55, January/February 2006.
24. D. Shang and M. E. Barkey "Analysis of Fatigue Crack Behavior Based on Dynamic Response Simulations and Experiments for Spot-Welded Joints," *Fatigue and Fracture of Engineering Materials & Structures*, Vol 29, pp. 23-30, 2006.
23. M. E. Stevenson, M. E. Barkey, and J. McDougall, "Stresses in Bent Copper Tubing: Application to Fatigue and Stress Corrosion Cracking Mechanisms," *Journal of Practical Failure Analysis*, Volume 5(6), pp 23-29, December 2005.
22. C. Olson, G. Rochau, S. Slutz, C. Morrow, R. Olson, M. Cuneo, D. Hanson, G. Bennett, T. Sanford, J. Bailey, W. Stygar, R. Vesey, T. Mehlhorn, K. Struve, M. Mazarakis, M. Savage, T. Pointon, M. Kiefer, S. Rosenthal, K. Cochrane, L. Schneider, S. Glover, K. Reed, D. Schroen, C. Farnum, M. Modesto, D. Oscar, L. Chhabildas, J. Boyes, V. Vigil, R. Keith, M. Turgeon, B. Cipiti, E. Lindgren, V. Dandini, H. Tran, D. Smith, D. McDaniel, J. Quintenz, M. K. Matzen, J. P. VanDevender, W. Gauster, L. Shephard, M. Walck, T. Renk, T. Tanaka, M. Ulrickson, W. Meier, J. Latkowski, R. Moir, R. Schmitt, S. Reyes, R. Abbott, R. Peterson, G. Pollock, P. Ottinger, J. Schumer, P. Peterson, D. Kammer, G. Kulcinski, L. El-Guebaly, G. Moses, I. Sviatoslavsky, M. Sawan, M. Anderson, R. Bonazza, J. Oakley, P. Meekunasombat, J. De Groot, N. Jensen, M. Abdou, A. Ying, P. Calderoni, N. Morley, S. Abdel-Khalik, C. Dillon, C. Lascar, D. Sadowski, R. Curry, K. McDonald, M.

- Barkey, W. Szaroletta, R. Gallix, N. Alexander, W. Rickman, C. Charman, H. Shatoff, D. Welch, D. Rose, P. Panchuk, D. Louie, S. Dean, A. Kim, S. Nedoseev, E. Grabovsky, A. Kingsep, V. Smirnov, "Development Path for Z-Pinch IFE" *Fusion Science and Technology* 47 (3), pp. 633-640, 2005.
21. G. Wang and M. E. Barkey "Fatigue Crack Identification in Tensile-Shear Spot Welded Structure by Dynamic Response Characteristics," *ASME Journal of Engineering Materials and Technology*, , Vol 127, pp. 310-317, 2005.
  20. D. Shang, M. E. Barkey, Y. Wang, and T. C. Lim, "Fatigue Damage and Dynamic Natural Frequency Changes of Spot Welded Joints," *SAE Transactions: Journal of Materials & Manufacturing*, Vol. 112, pp. 301-308, 2004. (Selected for the 2003 SAE Arch T. Colwell Merit Award.)
  19. G. Wang and M. E. Barkey "Experimental Investigation of Fatigue Cracking and Its Influence on Dynamic Response Characteristics of Spot Welded Specimens," *Experimental Mechanics*, Volume 44/3 pp. 512-521, 2004.
  18. Y. Guo, M. E. Barkey and D. Yen, "FE-Simulation of the Effects of Machining-Induced Residual Stress Profile on Rolling Contact of Hard Machined Components," *International Journal of Mechanical Sciences*, Volume 46/3 pp. 371-388, 2004.
  17. Y. Guo, M. E. Barkey and D. Yen, "Modelling of Rolling Contact Fatigue for Hard Machined Components with Process-Induced Residual Stress," *International Journal of Fatigue*, Volume 26, pp. 605-613, 2004.
  16. R. C. Bradt, M. E. Barkey, S. E. Jones and M. E. Stevenson, "Projectile Impact Fracture of Flat Glass," *Journal of Practical Failure Analysis*, Volume 3(1), pp. 5-10, 2003.
  15. D. Shang, M. E. Barkey, Y. Wang, and T. C. Lim, "Effect of Fatigue Damage on the Dynamic Response Frequency of Spot Welded Joints," *International Journal of Fatigue*, Volume 25/4, pp. 311-316, 2003.
  14. M. E. Stevenson, M. E. Barkey, and R. C. Bradt, "Fatigue Failures of Austenitic Stainless Steel Orthopedic Fixation Devices," *Journal of Practical Failure Analysis*, Volume 2(3), pp. 57-64, 2002.
  13. R. C. Bradt, M. E. Barkey, S. E. Jones and M. E. Stevenson, "Projectile Impact Fracture of Flat Glass," *Glass Researcher: Bulletin of Glass Science and Engineering*, Vol. 11, No. 2, pp. 20-23, 2002.
  12. M. E. Barkey and J. Han, "Fatigue Analysis of Spot Welds Subjected to a Variable Amplitude Loading History," *2001 SAE Transactions: Journal of Materials & Manufacturing*, Vol. 110, pp. 476-483, 2001.
  11. M. E. Barkey, H. Kang, and Y. Lee, "Failure Modes of Single Resistance Spot Welded Joints Subjected to Combined Fatigue Loading," *International Journal of Materials and Product Technology*, Vol. 16, Nos. 6/7, pp. 510-526, 2001.
  10. T. Zeiler and M. E. Barkey, "Design Sensitivities of Fatigue Performance and Structural Dynamic Response in an Automotive Application," *International Journal of Structural and Multidisciplinary Optimization*, Vol. 21, pp. 309-315, 2001.

9. M. E. Barkey and J. Han, "Fatigue Analysis of Spot Welds Subjected to a Variable Amplitude Loading History," *SAE Special Publication SP-1621 "Fatigue and Failure of Spot Welds and Welded Joints,"* November 2000.
8. H. Kang, M. E. Barkey, and Y. Lee, "Evaluation of Multiaxial Spot Weld Fatigue Parameters for Proportional Loading," *International Journal of Fatigue*, Vol. 22, pp. 691-702, 2000.
7. T. Zeiler and M. E. Barkey, "Analytical Design Sensitivity Derivatives of Time and Frequency Responses as an Aid to the Design Process," *International Journal of Vehicle Design*, Vol. 23, Nos. 1/2, pp. 176-190, 2000.
6. M. E. Barkey and H. Kang, "Testing of Spot Welded Coupons in Combined Tension and Shear," *Experimental Techniques*, Vol. 23, No. 5, pp. 20-22, 1999.
5. H. Kang and M. E. Barkey, "Fatigue Life Estimation of Spot-Welded Joints Using an Interpolation/Extrapolation Technique," *International Journal of Fatigue*, Vol. 21, pp. 769-777, 1999.
4. H. Y. Wang and M. E. Barkey, "A Strain Space Nonlinear Kinematic Hardening/Softening Plasticity Model," *International Journal of Plasticity*, Vol. 15, pp. 755-777, 1999.
3. H. Y. Wang and M. E. Barkey, "Strain Space Formulation of Armstrong-Frederick Family of Plasticity Models," *ASME Journal of Engineering Materials and Technology*, 120:230-235, 1998.
2. V. B. Köttgen, M. E. Barkey, and D. F. Socie, "Pseudo Stress and Strain Based Approaches to Multiaxial Notch Analysis," *Fatigue and Fracture of Engineering Materials and Structures*, Volume 18, Number 9, pp. 981-1006, 1995.
1. M. E. Barkey, D. F. Socie, and K. J. Hsia, "A Yield Surface Approach to the Estimation of Notch Strains for Proportional and Nonproportional Cyclic Loading," *ASME Journal of Engineering Materials and Technology*, 116:173-180, 1994.

## Refereed Conference Papers

24. M. E. Barkey, H. Ball, S. E. Jones, and P. Dong, "High Strain Rate Constitutive Modeling of Pure Titanium Using the Taylor Impact Test," PVP2014-28015, Proceedings of the ASME 2014 Pressure Vessels & Piping Division Conference, PVP2014, 2014, Anaheim, California.
23. J. A. Sharpe, M. B. Jordan, S. L. Burkett, and M. E. Barkey, "Analyzing the Behavior and Shear Strength of Common Adhesives used in Temporary Wafer Bonding," 2013 IEEE Electronic Components & Technology Conference.
22. J. T. Loveless, J. M. Conway, M. E. Barkey and S. E. Jones, "Compaction Ring Analysis of Concrete Penetration" PVP2012-78733, Proceedings of the ASME 2012 Pressure Vessels & Piping Division Conference, PVP2012, July 15-19, 2012, Toronto, Ontario.
21. J. M. Conway, K. T. O'Brien, M. E. Barkey, and S. E. Jones, "Taylor Cylinder Testing of Anisotropic Materials," PVP2012-78705, Proceedings of the ASME 2012 Pressure Vessels & Piping Division Conference, PVP2012, July 15-19, 2012, Toronto, Ontario.
20. Ming Li, De-Guang Shang, Xiao-Dong Liu, Jia Jin, Tao Chen, Yue-Bin Guo and M. E. Barkey, "Analysis of Fatigue Damage Repair Based on Laser Shock Processing for Copper Film," 2012 IEEE International Conference on Mechatronics and Automation (ICMA 2012) in Chengdu, Sichuan, China, August 5-8, 2012.
19. A. Nagabhushana, M. Spiegel, S. Adu, N. Hayes, D. Paul, K. Trivedi, B. Fairbee, H. Zheng, A. Gerrity, S. Kotru, S. Roy, M. Barkey, S. L. Burkett, "Numerical Analysis for Structural Health Monitoring of a Damaged Composite Panel using PZT Actuators and Sensors," *Smart Structures and Materials-- Non-Destructive Evaluation and Health Monitoring*, San Diego, March 11-14, 2012.
18. W. Li, Y. B. Guo, and M. E. Barkey, "Surface Integrity and Fatigue Strength of Hard Milled Surfaces," Proceedings of the 2011 ASME International Manufacturing Science and Engineering Conference, MSEC2011, June 13-17, 2011.
17. W. Li, Y. B. Guo, M. E. Barkey and C. Guo, "Tool Wear Influence on Surface Integrity and Fatigue Life of Hard Milled Surfaces," STLE/ASME International Joint Tribology Conference (IJTC) Los Angeles, CA, IJTC2011-61264.
16. M. E. Barkey and M. E. Stevenson "Failure Modes of Electrical Resistance Spot Welds," Materials Science & Technology 2007 Conference and Exposition, Detroit, MI, submitted March 2007.
15. J. Li, D. Park and M. E. Barkey "Soil Strength Characterization by Strip Loading Technique," CGS-IAH/CNC 2007 60th Canadian Geotechnical Conference & 8th Joint CGS/IAH-CNC Groundwater Conference, Ottawa, Ontario, Canada - October 21-24, 2007, submitted January 2007.

14. X. Zhang, M. E. Barkey, Y. Lee, M. Lu, E. Pakalnins, C. Orsette, W. Trojanowski, "DOE Analysis of Factors Affecting Ultimate Strength of Multiple Resistance Spot Welded Joints," *SAE Technical Paper 2007-01-1661* presented at the SAE World Congress, April 2007.
13. S.C. Ammula, Y. Guo, and M. E. Barkey, "A Finite Element Analysis Based Compliance Method Coupled with Wet Etching to Determine Residual Stress in High Speed Milling Aluminum Alloys," *2005 ASME International Congress and Exposition*, Paper Number: IMECE2005-80102, accepted July 2005.
12. R. C. Bradt, S. E. Jones, M. E. Barkey, and M. E. Stevenson, "Failure of Projectile Impact Resistant Glass Panels," in *Ceramic Armor and Armor Systems, Proceedings of the Ceramic Armor and Armor Systems Symposium*, 105th Annual Meeting of The American Ceramic Society, April 27-30, 2003, Nashville TN, Ed. by Eugene Medvedovski. Ceramic Transactions, Vol. 151, Published by the ACERS, Westerville, OH (2003) pp. 131-144.
11. Y. Guo, M. E. Barkey and D. Yen, "The Effects of Process-Induced Residual Stress Patterns on Rolling Contact Stress of Hard Machined Components," *2003 International Mechanical Engineering Congress and Exposition (IMECE): Advances in Machining of Hard Materials, Washington D.C.*, November 2003.
10. H. Wang and M. E. Barkey, "A Multiaxial Ratcheting Model for Notched Structures," accepted to *Fracture Mechanics 2003: Symposium of Structural Integrity & Material Aging, Shanghai*, August 2003 (not presented).
9. D. Shang, M. E. Barkey, Y. Wang, and T. C. Lim, "Fatigue Damage and Dynamic Natural Frequency Changes of Spot Welded Joints," *SAE Technical Paper 2003-01-0695* presented at the SAE World Congress, March 2003.
8. M. E. Barkey and J. Han, "Fatigue Analysis of Spot Welds Subjected to a Variable Amplitude Loading History," *SAE Technical Paper 2001-01-0435* presented at the SAE World Congress, March 2001.
7. M. E. Barkey and H. Wang, "A Strain Space Nonlinear Kinematic Hardening and Softening Plasticity Model". Presented at Plasticity '99 in Cancun, Mexico, January 1999. Published in conference proceedings "Constitutive and Damage Modeling of Inelastic Deformation and Phase Transformation," edited by Akhtar S. Khan (pp.7-10).
6. C. Midkiff, B. Todd, J. Parker, M. Barkey, and J. Gershenson, "Delivery of a Complete Undergraduate Engineering Degree by Distance Learning Using a Mobile Laboratory". ASEE section conference, 1997 published in refereed conference proceedings.
5. S. E. Jones, M. E. Barkey, W. K. Rule, and E. R. Huber, "Mechanical Characterization of Hardened Astralloy-V (R) Using the Taylor Impact Test". AIAA Space Programs and Technologies Conference and Exhibit, Huntsville, Alabama, September 1996. Published as preprint number AIAA-96-4294, 8 pages, also published in conference proceedings.

4. W. K. Rule, M. E. Barkey, and S. E. Jones, "Numerical and Analytical Modeling of Hypervelocity Impacts on a Whipple Bumper System". AIAA Space Programs and Technologies Conference and Exhibit, Huntsville, Alabama, September 1996. Published as preprint number AIAA-96-4364, 7 pages, also published in conference proceedings.
3. M. E. Barkey, V. B. Köttgen, and M. Hack. "Pseudo-Stress Space Plasticity and Detection of Near-Proportional Loading." Accepted for presentation at Engineering Against Fatigue conference, Sheffield, March 1996 (not presented).
2. V. B. Köttgen, M. E. Barkey, and D. F. Socie, "Structural Stress-Strain Analysis of Nonproportional Loading Suitable for FEM Postprocessing", presented at Fatigue Design 1995 in Helsinki, Finland.
1. M. E. Barkey and D. F. Socie, "Calculation of Notch Strains for Nonproportional Cyclic Loading Using a Structural Yield Surface", Societe Francaise de Metallurgie et de Materiaux (France), pp. 225-238, 1994; Multiaxial Fatigue and Design by the European Structural Integrity Society (ESIS-21), edited by A. Pineau, G. Cailletaud, and T.C. Lindley, 1996.

## Other Technical Publications

8. S. McKelvey, Y. Lee, and M. E. Barkey “Stress-Based Uniaxial Fatigue Analysis Using Methods Described in FKM-Guideline,” Feature Article in the *Journal of Failure Analysis and Prevention*, Vol. 12, No. 5. pp. 445-489, October 2012 (feature article).
7. J. Sharpe, M. Jordan, M. E. Barkey, and S. Burkett “Quantitative Analysis of Adhesive Strength for Silicon Wafer Bonding,” Poster Presentation, 2012 Undergraduate Research Conference at The University of Alabama, April 6, 2012.
6. M. Farooq, H. Zheng, A. Nagabhushana, S. Roy, S. Burkett, M. Barkey, S. Kotru and E. Sazonov “Damage Detection and Identification in Smart Structures using Support Vector Machines and Artificial Neural Networks,” Poster Presentation *Smart Structures and Materials--Non-Destructive Evaluation and Health Monitoring*, San Diego, March 11-14, 2012.
5. M. C. Turgeon and M. E. Barkey, “Z-Pinch Power Plant Recyclable Transmission Line (RTL) Structural Analysis & Experiments,” Sandia National Laboratories Research Report, December, 2004.
4. P. K. Chodimella, M. E. Barkey, and S. E. Jones, “Impact Failure Modeling of a Spot Welded Joint,” *presented at the 2003 SAE World Congress*, March 2003.
3. P. K. Chodimella, M. E. Barkey, and S. E. Jones. “High Velocity Impact Simulation of Spot Welded Joints.” Abstract and Animated Computer Simulation accepted to SC2001 (Supercomputer Conference), November 10-16, Denver, Colorado, 2001. Demonstration made by the Alabama Supercomputer Center.
2. M. E. Barkey and M. Hack. “FALANCS Fatigue Analysis and Computation Theory Manual.” For LMS Durability Technologies. (Theory Manual for fatigue analysis software.) 1999.
1. M. E. Barkey and M. Hack. “FALANCS Fatigue Analysis and Computation System Manual.” For LMS Durability Technologies. (User’s Manual for fatigue analysis software.) 1998.

## Grants Awarded

28. “Lightweight, Light Duty Expeditionary Airfield Surfacing System” \$1,337,722 (\$890,994 Consortium for Energy, Environment and Demilitarization, \$446,728 UA cost share) 8/2/16 to 11/1/18. P. Allison (0.40), J.B. Jordon (0.40), M.E. Barkey (0.10).
27. “Zn-based Liquid Metal Embrittlement During Resistance Spot Welding of Advanced High Strength Steels” \$97,988 Mercedes-Benz U.S. International, Inc., 1/1/16 to 12/31/16. L. Brewer (0.75), M.E. Barkey (0.25).
26. “Friction Stir Welding System” \$200,000 Alabama Department of Commerce, 10/1/15 to 4/1/16. J.B. Jordon (0.30), L. Brewer (0.30), P. Allison (0.10), G. Thompson (0.10), Y. Guo (0.10) M.E. Barkey (0.10).
25. “Effect of Residual Stresses on Fatigue Damage in Self-Pierce Riveting” \$75,000 U.S. Automotive Materials Partnership, 5/1/15 to 11/1/15. J.B. Jordon (0.53), M.E. Barkey (0.47).
24. “Strength and Stiffness Characterization of Composite Tubes” \$1,800 Britt Engineering, 1/11/13 to 12/31/15. M. E. Barkey (0.5), J. Richardson (0.5).
23. “Mechanical Characterization of Heat Aged Rubber” \$90,862 Chrysler Corporation, 8/31/13 to 8/30/14. M. E. Barkey (1.0).
22. “Water Quench Thermal Fatigue Testing” \$15,622 Southern Company Services, 9/1/12 to 5/31/13. M. E. Barkey (1.0).
21. “UA Research Stimulation Program Optimized Condition Based Maintenance for Composite Structures” \$70,000 The University of Alabama, 6/16/12 to 6/15/14. S. Roy (0.2), M. E. Barkey (0.2), S. Burkett (0.2), S. Kotru (0.2), E. Sazanov (0.2).
20. “Fatigue Consulting” \$4,980 University of New Orleans, 5/16/12 to 6/15/12. M. E. Barkey (1.0).
19. “Fatigue Testing” \$4,949 University of New Orleans, 5/16/12 to 6/15/12. M. E. Barkey (1.0).
18. “Diagnostic Sensing for Predictive Maintenance of Aerospace Vehicles,” \$500,000 NASA-MSFC 10/1/10 to 6/30/12. S. Roy (0.25), S. Burkett (0.25), M. E. Barkey (0.25), S. Kotru (0.25).
17. “Fatigue and Durability Characterization of Friction Plug Welded Joints,” \$84,566, NASA-MSFC 1/21/09 to 1/20/10. M. E. Barkey (1.0).
16. “Mechanics of Materials Lecture and Lab: Integration and Collaboration,” \$10,500 The University of Alabama Office of Assessment & Institutional Effectiveness, 5/16/08-5/15/09. M. E. Barkey (1.0)
15. “Durability Characterization of Metal Light Poles,” \$25,150 (\$22,500 + \$2,650 supplement) (Cooper Lighting), 9/24/07 to 9/23/08. M. E. Barkey (1.0).
14. “Pressure Testing of Recyclable Transmission Lines for Inertial Fusion Energy Power Plant Tasks 2 & 3,” \$87,397 (Sandia National Laboratories), 5/25/05 to 9/15/06. M. E. Barkey (1.0).



13. "Pressure Testing of Recyclable Transmission Line for Inertial Fusion Energy Power Plant," \$71,074 (Sandia National Laboratories), 8/9/04 to 9/30/04. M. E. Barkey (1.0).
12. "Strength Characterization of Welded and Weld-Bonded Joints," \$92,865 (\$50,000 DaimlerChrysler (cash)/\$20,000 DaimlerChrysler (in-kind)/\$22,865 UA), 6/16/04 to 6/15/05. M. E. Barkey (1.0).
11. "An Experimental and Numerical Analysis of Durability for Powertrain and Structural Vehicle Components," \$229,001 (\$77,073 CAVT/\$69,928 UA), 5/16/03 to 9/30/04. Y. Guo (0.50) and M. E. Barkey (0.50).
10. "An Analytical, Computational and Experimental Study of the Dynamics, Durability and NVH Characteristics of Automotive Structures: Year 4," \$159,370 (\$80,000 CAVT/\$110,797 UA & Partners), 5/16/02 to 8/15/03. M. E. Barkey (0.50) and S. McInerny (0.50).
9. "A Novel Technique for Determining Crash Performance of Spot Welded Joints," \$63,300 (\$25,000 CAVT/\$38,300 UA), 5/16/01 to 8/15/02. M. E. Barkey (0.50) and S. E. Jones (0.50).
8. "An Analytical, Computational and Experimental Study of the Dynamics, Durability and NVH Characteristics of Automotive Structures: Year 3," (\$80,000 CAVT, with UA and industrial match), 5/16/01 to 8/15/02. Lim (0.50) and M. E. Barkey (0.50).
7. "Fatigue Characterization of Riveted Aluminum Joints," \$29,925 (Ford), 1/01/01 to 5/01/01. M. E. Barkey (1.0).
6. "An Analytical, Computational and Experimental Study of the Dynamics, Durability and NVH Characteristics of Automotive Structures: Year 2," \$159,370 (\$80,000 CAVT/\$29,370 UA/\$50,000 Ford), 5/16/00 to 5/15/01. T. Lim (0.50) and M. E. Barkey (0.50).
5. "Fatigue Characterization of Adhesively Bonded Aluminum Coach Peel Joints," \$16,490 (Ford), 10/01/99 to 12/01/99. M. E. Barkey (1.0).
4. "Investigation of a Physically Based Multiaxial Hardening and Softening Parameter," \$4,986 (The University of Alabama Research Advisory Committee), 7/01/99 to 7/25/99. M. E. Barkey (1.0).
3. "An Analytical, Computational and Experimental Study of the Dynamics, Durability and NVH Characteristics of Automotive Structures: Year 1," \$183,370 (\$99,909 CAVT/\$33,461 UA/\$50,000 Ford, Edison Welding Institute), 5/16/99 to 5/15/00. T. Lim (0.50) and M. E. Barkey (0.50).
2. "Fatigue Analysis of Spot Welds under Combined Tension and Shear", Chrysler Challenge Fund, \$138,663 (\$69,530 Chrysler/\$69,133 UA), 6/15/98 to 6/15/00. M. E. Barkey (1.0).
1. "Multiaxial Plasticity Modelling for Fatigue Analysis", General Motors Corporation, \$10,000 (GM), 7/16/97 to 10/15/97. M. E. Barkey (1.0).

**For more information or to view current laboratory facilities, see  
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