

Dr. Jason R. Mayeur
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Mechanical and Aerospace Engineering Dept.
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Education

Ph.D. in Mechanical Engineering	Georgia Institute of Technology, Atlanta, GA	2010
M.S. in Mechanical Engineering	Georgia Institute of Technology, Atlanta, GA	2004
B.S. in Mechanical Engineering	University of Kentucky, Lexington, KY	2000

Employment Overview

Assistant Professor, University of Alabama in Huntsville	2018-present
Sr. Research Engineer, CFD Research Corp.	2017-2018
Staff Scientist, Los Alamos National Laboratory	2013 - 2017
Postdoctoral Research Associate, Los Alamos National Laboratory	2011-2013
Graduate Research Assistant, Georgia Institute of Technology	2001-2011
Summer Intern, Sandia National Laboratories	2004-2007
Structural Analyst, Lexmark International, Inc.	1999-2001
CAD Support Engineer, Lexmark International, Inc.	1998-1999

Research Experience

University of Alabama in Huntsville, Mechanical and Aerospace Engineering Dept., Asst. Professor

- Dr. Mayeur's research focuses on using multiscale modeling and computational mechanics of materials to study the process-microstructure-property-performance relationships of engineering materials. The goal of my research is to increase the efficiency with which next generation materials and manufacturing processes are designed and certified.

CFD Research Corporation, Biomedical and Energies Technology Division, Sr. Research Engineer

- Developed and applied microstructural scale constitutive models to study high strain rate thermomechanical response and multiscale damage processes for engineering materials using particle-based continuum methods, e.g. peridynamics.

Los Alamos National Laboratory, Theoretical Division, Staff Scientist

- Developed and implemented a new multi-physics approach to single crystal plasticity applicable under extreme loading conditions (large deformation, deformation rates, and pressures).
- Developed a scale-dependent crystal plasticity constitutive framework that accounts energy storage and dissipation at material interfaces, e.g. grain and/or phase boundaries.
- Applied scale-dependent crystal plasticity models to understand the interplay between intragranular and interfacial mediated deformation mechanisms in Cu-Nb nanolamellar composites.

Los Alamos National Laboratory, Theoretical Division, Postdoctoral Research Associate

- Performed mesoscale crystal plasticity finite element simulations to develop an understanding of the unique crystallographic texture evolution in bimetallic (Cu-Nb) multilayered nanocomposites fabricated via accumulative roll bonding.

Georgia Institute of Technology, Mechanical Engineering Dept., Graduate Research Assistant (Ph.D.)

- Developed and implemented a dislocation density-based micropolar (size-dependent) single crystal plasticity model. Performed finite element simulations using the micropolar crystal plasticity model to study size-dependent mechanical behavior in single and polycrystalline metals.

Georgia Institute of Technology, Mechanical Engineering Dept., Graduate Research Assistant (M.S.)

- Developed and implemented a microstructure-sensitive single crystal plasticity constitutive model for a dual-phase titanium-aluminum alloy (Ti-6Al-4V). Performed grain scale finite element simulations of attachment fatigue to assess the impact of phase morphology and crystallographic texture on fatigue crack initiation.

Research Interests

- Process-microstructure-property relationships of engineering materials
- Computational solid mechanics
- Finite deformation plasticity and damage
- Generalized continuum theories for modeling scale-dependent plasticity
- Interface-dominated plasticity
- Multiscale modeling of plasticity and damage
- Dislocation mechanics

Teaching Experience

University of Alabama in Huntsville

- MAE/CEE 672 Theory of Elasticity (Fall 2018)

Georgia Institute of Technology, Graduate Teaching Assistant

- ME 2110 Creative Decisions and Design (Spring 2009)
- MSE 3003 Mechanical Behavior of Materials (Fall 2008)
- ME 6201 Principles of Continuum Mechanics (Fall 2003)

Professional Service and Affiliations

- Reviewer: International Journal of Plasticity, Journal of the Mechanics and Physics of Solids, Acta Materialia, Scripta Materialia, Modelling and Simulation in Materials Science and Engineering, International Journal of Solids and Structures, International Journal of Damage Mechanics, Fatigue and Fracture of Engineering Materials & Structures, International Journal of Mechanical Sciences.
- Guest Editor: Special issue of *Advances in Mathematical Physics* on “Mechanics and Geometry of Solids and Surfaces”.
- Member: American Society of Mechanical Engineers (ASME); The Minerals, Metals and Materials Society (TMS)

Honors and awards

LANL LDRD Early Career Award	12/2014
Magna Cum Laude University of Kentucky	12/2000
University of Kentucky College of Engineering Scholarship	1997-2000
University of Kentucky Academic Excellence Scholarship	1996-1997; 1998-2000
Pi Tau Sigma Mechanical Engineering Honor Society	1998

Peer-reviewed Journal Articles

1. Cho, H., Bronkhorst, C. A., Mourad, H. M., Mayeur, J. R., & Luscher, D. J. (2018). Anomalous plasticity of body-centered-cubic crystals with non-Schmid effect. *International Journal of Solids and Structures*, 139, 138-149.
2. Lieou, C.K.C., Mayeur, J.R., and Beyerlein, I.J. (2017) Deformation in amorphous-crystalline nanolaminates – an effective temperature theory and interaction between defects, *Modelling and Simulation in Materials Science and Engineering*, 25, 034002.

3. Mayeur, J.R., Mourad, H.M., Luscher, D.J., Hunter, A., Kenamond, M.A. (2016) Numerical implementation of a crystal plasticity model with dislocation transport for high strain rate applications, *Modelling and Simulation in Materials Science and Engineering*, 24, 045013.
4. Luscher, D. J., Mayeur, J.R., Mourad, H. M., Hunter, A., Kenamond, M. A. (2016) Coupling continuum dislocation transport with crystal plasticity for application to shock loading conditions, *International Journal of Plasticity*, 76, 111-129.
5. Beyerlein, I. J., Mayeur, J.R. (2015) Mesoscale investigations for the evolution of interfaces in plasticity, *Current Opinion in Solid State and Materials Science*, 19, 203-211.
6. Mayeur, J.R., McDowell, D.L. (2015) Micropolar crystal plasticity simulation of particle strengthening. *Modelling and Simulation in Materials Science and Engineering*, 23, 065007.
7. Mayeur, J.R., Beyerlein, I.J., Bronhorst, C.A., Mourad, H.M. (2015) Incorporating interface affected zones into crystal plasticity, *International Journal of Plasticity*, 65, 206-225.
8. Carpenter, J.S. McCabe, R.J., Mayeur, J.R., Mara, N.A., Beyerlein, I.J. (2015) Interface-driven plasticity: The presence of an interface affected zone in metallic lamellar composites. *Advanced Engineering Materials*, 17, 109-114.
9. Beyerlein, I.J., Mayeur, J.R., McCabe, R.J., Zheng, S.J., Carpenter, Mara, N.A. (2014) Influence of slip and twinning on the crystallographic stability of bimetal interfaces in nanocomposites under deformation, *Acta Materialia*, 72, 137-147.
10. Mayeur, J.R., Beyerlein, I.J., Bronhorst, C.A., Mourad, H.M. (2014) The influence of grain interactions on the plastic stability of heterophase interfaces, *Materials*, 7, 302-322.
11. Monclus, M.A., Zheng, S.J., Mayeur, J.R., Beyerlein, I.J., Mara, N.A., Polcar, T., Llorca, J., Molina-Aldareguia, J.M. (2014) Optimum high temperature strength of two-dimensional nanocomposites, *APL Materials*, 1, 052103.
12. Beyerlein, I.J., Mayeur, J.R., Zheng, S.J., Mara, N., Wang, J., A., Misra, A. (2014) Emergence of stable interfaces under extreme plastic deformation, *Proceedings of the National Academy of Sciences*, 111, 4386-4390.
13. Mayeur, J.R., McDowell, D.L. (2014) A comparison of Gurtin type and micropolar theories of generalized single crystal plasticity, *International Journal of Plasticity*, 57, 29-51.
14. Mayeur, J.R., McDowell, D.L. (2013) An evaluation of higher-order single crystal strength models for constrained thin films subjected to simple shear, *Journal of the Mechanics and Physics of Solids*, 61, 1935-1954.
15. Mayeur, J.R., Beyerlein, I.J., Bronkhorst, C.A., Mourad, H.M., Hansen, B.L. (2013) A crystal plasticity study of heterophase interface character stability of Cu/Nb bicrystals, *International Journal of Plasticity*, 48, 72-91.
16. Hansen, B.L., Carpenter, J.S., Sintay, S.D., Bronkhorst, C.A., McCabe, R.J., Mayeur, J.R., Mourad, H.M., Beyerlein, I.J., Mara, N.A., Chen, S.R., Gray III, G.T. (2013) Modeling the texture evolution of Cu/Nb Layered composites during rolling, *International Journal of Plasticity*, 49, 71-84.
17. Beyerlein, I.J., Mara, N.A., Carpenter, J.S., Nizolek, T., Mook, W., McCabe, R.J., Mayeur, J.R., Kang, K., Zheng, S.J., Wang, J., Pollack, T. (2013) Interface-driven microstructure development and ultra high strength of bulk nanostructured Cu/Nb multilayers fabricated by severe plastic deformation, *Journal of Materials Research*, 28, 1799-1812.
18. Bronkhorst, C.A., Mayeur, J.R., Beyerlein, I.J., Mourad, H.M., Hansen, B.L., Mara, N.A., Carpenter, J.S., McCabe, R.J., Sintay, S.D. (2013) Meso-scale modeling the orientation and interface stability of Cu/Nb-layered composites by rolling, *JOM*, 65, 431-442.
19. Mayeur, J.R., McDowell, D.L., Bammann, D.J. (2011) Dislocation-based micropolar single crystal plasticity: Comparison of multi- and single criterion theories, *Journal of the Mechanics and Physics of Solids*, 59, 398-422.
20. Mayeur, J.R., McDowell, D.L. (2011) Bending of single crystal thin films modeled with micropolar crystal plasticity, *International Journal of Engineering Science*, 49, 1357-1366.
21. Mayeur, J.R., McDowell, D.L., Neu, R.W. (2008) Crystal plasticity simulations of fretting of Ti-6Al-4V in partial slip regime considering effects of texture, *Computational Materials Science*, 41, 356-365.

22. Mayeur, J.R., McDowell, D.L. (2007) A three-dimensional crystal plasticity model for duplex Ti-6Al-4V, *International Journal of Plasticity*, 23, 1457-1485.

Book Chapters

1. Mayeur, J. R., McDowell, D. L., & Forest, S. (2018). Micropolar Crystal Plasticity. *Handbook of Nonlocal Continuum Mechanics for Materials and Structures*, Ed. George Z. Voyiadjis, Springer, 1-47.
2. Forest, S., Mayeur, J.R., McDowell, D.L. Micromorphic Crystal Plasticity, *Handbook of Nonlocal Continuum Mechanics for Materials and Structures*, Ed. George Z. Voyiadjis, Springer, 1-44.

Conference Proceedings, Technical Reports, and Theses

1. Luscher, D.J., Kenamond, M.A., Hunter, A., Mayeur, J.R., Mourad, H.M., Implementation of a Dislocation-density Based Single-Crystal Model into a Continuum Shock Hydrodynamics Code, Proceedings of the 20th Biennial Conference of the APS Topical Group on Shock Compression of Condensed Matter (SCCM 2017), St. Louis, Missouri, July 9-14, 2017.
2. Mayeur, J.R., McDowell, D.L., A study of two approaches to higher-order single crystal plasticity, presented at ICTAM 2016, Montreal, Canada, August 21-26, 2016.
3. Livescu, V., Bronkhorst, C.A., Vander Wiel, S.A., Mayeur, J.R., Brown, D.W., Dippo, O. (2016) Capturing the Complexity of Additively Manufactured Microstructures, Proceedings of The Ninth Pacific Rim International Conference on Advanced Materials and Processing (PRICM9), Kyoto, Japan, August 1-5, 2016.
4. Mayeur, J.R., McDowell, D.L., Heterogeneous deformation of polycrystals simulated with micropolar single crystal plasticity, presented at 3rd International Conference on Heterogeneous Material Mechanics, Shanghai, China, May 22-26, 2011.
5. Mayeur, J. R., Generalized continuum modeling of scale-dependent crystalline plasticity, Ph.D. dissertation, Georgia Institute of Technology, 2010.
6. Zimmerman, J. A., Jones, R. E., Templeton, J. A., McDowell, D. L., Mayeur, J. R., Tucker, G. J., Bammann, D. J., and Gao, H., Development of advanced continuum models that incorporate nanomechanical deformation into engineering analysis, Technical Report SAND2008-6066, Sandia National Laboratories, Albuquerque, NM and Livermore, CA, 2008.
7. Mayeur, J. R., McDowell, D. L., and Neu, R. W., Role of texture and microstructure in fretting fatigue of Ti-6Al-4V, 9th International Fatigue Congress, Atlanta, GA, May 14-19, 2006.
8. Mayeur, J. R., Three dimensional modeling of Titanium-Aluminum alloys with application to attachment fatigue, M.S. Thesis, Georgia Institute of Technology, 2004.
9. Mayeur, J. R., McDowell, D. L., and Neu, R. W., Fretting fatigue of Ti-6Al-4V: A micromechanical approach, Materials Damage Prognosis, Materials Science and Technology 2004, New Orleans, LA, Sept. 26-29, 2004.

Technical presentations

1. Mayeur, J.R., McDowell, D.L., A study of two approaches to higher-order single crystal plasticity, presented at ICTAM 2016, Montreal, Canada, August 21-26, 2016.
2. Mayeur, J.R., Beyerlein, I.J., Nonlocal crystal plasticity simulations of the size-dependent mechanical response of fcc/bcc multilayers, presented at TMS 2016, Nashville, TN, February 14-18, 2016.
3. Mayeur, J.R., Beyerlein, I.J., The development of preferred interfaces in roll bonded Cu-Nb multilayer composites: Experiments and simulations, presented at the Workshop on Interface Mediated Plasticity in Nanostructured and Architected Materials, Poitiers, France, June 16, 2015.
4. Mayeur, J.R., Mourad, H.M., Luscher, D.J., Hunter, A., Kenamond, M.A., Continuum Dislocation Dynamics Simulations of Shock Loading, presented at 2015 MACH Conference, Annapolis, MD, April 8-10, 2015
5. Mayeur, J.R., Beyerlein, I.J., Bronkhorst, C.A., Mourad, H.M., Incorporating interface affected zones into crystal plasticity, presented at TMS 2015, Orlando, FL, March 15-19, 2015.

6. Mayeur, J.R., Beyerlein, I.J., Bronkhorst, C.A., Mourad, H.M., The influence of grain interactions on the plastic stability of heterophase interfaces, presented at the International Symposium on Plasticity, Freeport, Bahamas, January 3-8, 2014.
7. Bronkhorst, C.A., Mayeur, J.R., Beyerlein, I.J., Mourad, H.M., Hansen, B.L., Modeling the Crystallographic and Morphological Evolution of Cu/Nb Layered Composites by Accumulated Roll Bonding, presented at the U.S. National Congress on Computational Mechanics, Raleigh, NC, July 22-25, 2013.
8. Luscher, D.J., Mayeur, J.R., Bronkhorst, C.A., McDowell, D.L., Influence of Length Scale Parameters for Nonlocal Crystal Plasticity on Localization in Polycrystalline Specimens, presented at the U.S. National Congress on Computational Mechanics, Raleigh, NC, July 22-25, 2013.
9. Mayeur, J.R., Beyerlein, I.J., Bronkhorst, C.A., Mourad, H.M., Predicting predominant interfaces in Cu-Nb multilayer nanolamellar composites synthesized via accumulative roll bonding, presented at the International Symposium on Plasticity, Nassau, Bahamas, January 3-8, 2013.
10. Mayeur, J.R., Beyerlein, I.J., Bronkhorst, C.A., Mourad, H.M., Hansen, B.H., Crystal Plasticity Modeling of the Interfacial Stability of Cu/Nb Bicrystals, presented at the International Symposium on Plasticity, Nassau, Bahamas, January 3-8, 2013.
11. Mayeur, J.R., Beyerlein, I.J., Bronkhorst, C.A., Mourad, H.M., Hansen, B.H., Crystal plasticity modeling of the interfacial stability of Cu/Nb bicrystals, presented at the 49th Annual Technical Meeting of The Society of Engineering Science, Atlanta, GA, October 10-12, 2012.
12. Mayeur, J.R., McDowell, D.L., Micropolar crystal plasticity at the micron scale, presented at the International Workshop on Computational Materials Modeling, Baltimore, MD, September 24-26, 2012.
13. Mayeur, J.R., Mourad, H.M., Beyerlein, I.J., McDowell, D.L., Bammann, D.J., Dislocation-based micropolar crystal plasticity with evolving length scales, presented at the ASME IMECE, Denver, CO, November 11-17, 2011.
14. Mayeur, J.R., Bammann, D.J., McDowell, D.L., Dislocation density based micropolar single crystal plasticity, presented at the 2nd International Conference on Material Modeling, Paris, France, August 31-September 2, 2011.
15. Mayeur, J.R., McDowell, D.L., Micropolar crystal plasticity simulations of size-dependent particle strengthening, presented at the International Symposium on Plasticity, Puerto Vallarta, Mexico, January 3-8, 2011.
16. Mayeur, J.R., McDowell, D.L., A comparison of micropolar and slip gradient-based approaches to single crystal plasticity, presented at the International Symposium on Plasticity, St. Kitts and Nevis, January 3-8, 2010.
17. Mayeur, J.R., McDowell, D.L., Bammann, D.J., A micropolar model of crystal plasticity, presented at the International Symposium on Plasticity, St. Thomas, U.S. Virgin Islands, January 3-8, 2009.
18. Mayeur, J.R., McDowell, D.L., Neu, R.W., Microstructural representation and its effect on prediction of plastic ratcheting during fretting fatigue, presented at the ASME IMECE, Orlando, FL, November 5-11, 2005.
19. Mayeur, J.R., McDowell, D.L., Neu, R.W., Effect of crystallographic texture on deformation fields in fretting contacts, presented at the World Tribology Congress III, Washington, D.C., September 12-16, 2005.
20. Mayeur, J.R., McDowell, D.L., Neu, R.W., Plastic ratcheting in fretting fatigue, presented at the ASME IMECE, Anaheim, CA, November 14-19, 2004.
21. Mayeur, J.R., McDowell, D.L., Crystal plasticity modeling of alpha-beta Ti-Al alloys, presented at the ASME IMECE, Washington, DC, November 15-21, 2003.