

Aaron Stebner, PhD

Mechanical Engineering, Colorado School of Mines
1610 Illinois St. Brown Hall W310A, Golden, CO 80401
(303) 273-3091 (w) (847) 707-2932(c) astebner@mines.edu

Education	Doctor of Philosophy in Mechanical Engineering Certificate in Predictive Science and Engineering Design Certificate in Management from Kellogg School of Management <i>Northwestern University - Evanston, IL</i> "Partitioning of Elastic, Transformation, and Plastic Strains of Shape-Memory Nickel-Titanium through Modeling and Neutron Diffraction"	August 2012
	Master of Science in Mechanical Engineering <i>The University of Akron - Akron, OH</i> "Development, Characterization, and Design Considerations of Ni _{19.5} Ti _{50.5} Pd ₂₅ Pt ₅ High-Temperature Shape Memory Alloy Helical Actuators"	December 2007
	Bachelor of Science in Mechanical Engineering Minor in Applied Mathematics <i>The University of Akron - Akron, OH</i>	May 2005
Awards and Honors	<ul style="list-style-type: none">• NSF-CAREER Award 2015• International Advisory Committee Member of International Conference on Martensitic Transformations (ICOMAT) 2014• Elected President of ASM Shape Memory and Superelastic Technologies (SMST) 2015• Elected Board Member of SMST 2012 <u>Ph.D.</u> <ul style="list-style-type: none">• Toshio Mura Dissertation Fellowship 2011-2012• Mechanical Engineering Graduate Leadership and Service Award 2011• Management for Scientists and Engineers Scholarship (Kellogg School of Management) 2011• Physical Metallurgy Gordon-Kenan Research Seminar - Invited Speaker 2011• Willard Residential College Graduate Associate 2010-2012• Predictive Science and Engineering Design Fellowship 2009-2010• Los Alamos National Laboratory Neutron Scattering School Scholarship 2010• Walter P. Murphy PhD Fellowship 2009-2010 <u>M.S. & Undergrad</u> <ul style="list-style-type: none">• NASA Graduate Student Researcher Program Fellowship 2005-2008• Thomas M. Brittain Award in Mechanical Engineering 2005	
Academic Appointments	Assistant Professor <i>Colorado School of Mines – Golden, CO</i>	June 2013 - Present
	Lecturer - Segal Design Institute <i>Northwestern University - Evanston, IL</i> • Cumulative Anonymous Teaching Evaluation Score 5.31/6.00	August 2009 - June 2012
	Postdoctoral Researcher <i>California Institute of Technology – Pasadena, CA</i> • PI – Prof. Guruswami Ravichandran • Collaborator/Mentor – Prof. Kaushik Bhattacharya	August 2012 - July 2013

Graduate Research Fellow August 2008
-August 2012
Northwestern University - Evanston, IL

- Advisor – Prof. L. Catherine Brinson
- Committee – Profs. Gregory B. Olson, David C. Dunand, John W. Rudnicki

NASA Graduate Student Researcher Program Fellow August 2005
- April 2008
NASA Glenn Research Center – Cleveland, Ohio

- NASA GSRP Sponsor – Dr. Dexter Johnson
- NASA Technical Advisors – Drs. Ronald D. Noebe, Santo A. Padula II

Graduate Research Fellow
The University of Akron – Akron, Ohio

- Advisor – Dr. D. Dane Quinn

Undergraduate Research Assistant November 2004
- May 2005
The University of Akron - Akron, Ohio

- Advisor – Dr. D. Dane Quinn

**Industry
Positions**

Shape Memory Alloy Technology Consultant April 2011
- Present
Self Employed - Littleton, Colorado

Research Scientist April 2008
- June 2009
Telezgology, Inc. - Chicago, Illinois

Mechanical Engineer June 1995
- October 2000
Electric Device Corporation – Canfield, Ohio

**Peer
Reviewed
Journal
Publications**

1. Stebner, A.P. “Nitinol Mechanics: Myths and Truths” 2015 *Shape Memory and Superelasticity* (In Preparation) **Invited by Editor.**
2. Kelly, A. Stebner, A.P. Bhattacharya, K. “A Micromechanics-Inspired Constitutive Model for Shape Memory Alloys that Accounts for Initiation and Saturation of Phase Transformation” 2015 *Journal of the Mechanics and Physics of Solids* (In Review).
3. Stebner, A.P. Paranjape, H.M. Clausen, B. Brinson, L.C. Pelton, A.R. “In-situ Neutron Diffraction Studies of Large Monotonic Deformations of Superelastic Nitinol” 2015 *Shape Memory and Superelasticity* 1 (In Press) **Invited by Editor.**
4. Pelton, A.R. Clausen, B. Stebner, A.P. “In-situ Neutron Diffraction Studies of Increasing Tension Pre-strain Amplitudes of Superelastic Nitinol” 2015 *Shape Memory and Superelasticity* 1 (In Review) **Invited by Editor.**
5. Zhu, P. Stebner, A.P. Brinson, L.C. “Plastic and Transformation Interactions of Pores in Shape Memory Alloy Plates” 2014 *Smart Materials and Structures* 23:104008.
6. Stebner, A.P. Bigelow, G.S. Yang, J. Saghaian, S.M. Karaca, H.E. Padula, S.A. Garg, A. Gaydos, D. Bhattacharya, K. Noebe, R.D. Chumlyakov, Y. “Transformation Strains and Temperatures of a Nickel-Titanium-Hafnium High Temperature Shape Memory Alloy” 2014 *Acta Materialia* 76:40-53.
7. Benafan, O. Brown, J. Calkins, F.T. Kumar, P. Stebner, A.P. Turner, T.L. Vaidyanathan, R. Webster, J. Young, M.L. “Shape Memory Alloy Actuator Design: CASMART Collaborative Best Practices” 2013 *International Journal of Mechanics and Materials in Design* 2014 10:1-42.
8. Zhu, P. Stebner, A.P. Brinson, L.C. “A Numerical Study of Defect Effects on Transformation Fields during Superelastic Deformation” 2013 *Smart Materials and Structures* 22:094009.

9. Stebner, A.P. Sisneros, T.A. Vogel, S. Clausen B. Brown, D.W. Garg, A. Noebe R.D. Brinson, L.C. "Micromechanical Quantification of Elastic, Twinning, and Slip Strain Partitioning Exhibited by Polycrystalline, Monoclinic Nickel-Titanium During Large Uniaxial Deformations Measured via In-Situ Neutron Diffraction" 2013 *Journal of the Mechanics and Physics of Solids* 61(11):2302-2330.
10. Stebner, A.P. Brown, D.W. Brinson, L.C. "Measurement of Elastic Constants of Monoclinic Nickel-Titanium and Validation of First Principles Calculations" 2013, *Applied Physics Letters* 102:211908.
11. Stebner, A.P. Brown, D.W. Brinson, L.C. "Young's Modulus Evolution and Texture Based Elastic-Inelastic Strain Partitioning of Large Uniaxial Deformations of Monoclinic Nickel-Titanium" 2013, *Acta Materialia* 61:1944-1956.
12. Stebner, A.P. and Brinson, L.C. "Explicit Finite Element Implementation of an Improved Three-Dimensional Constitutive Model for Shape Memory Alloys" 2013, *Computer Methods in Applied Mechanics and Engineering* 257:17-35.
13. Gao, X. Stebner, A. Brown, D.W. Brinson, L.C. "Neutron Diffraction Studies and Multivariant Simulations of Shape Memory Alloys: Concurrent Verification of Texture Development – Mechanical Response Predictions" 2011, *Acta Materialia* 59:15 5924-5937.
14. Stebner, A. Gao, X. Brown, D.W. Brinson, L.C. "Neutron Diffraction Studies and Multivariant Simulations of Shape Memory Alloys: Empirical Texture Development – Mechanical Response Relations of Martensitic Nickel-Titanium" 2011, *Acta Materialia* 59:7 2841-2849.
15. Stebner, A. Padula, S. Noebe, R. Lerch, B. Quinn, D "Development, Characterization, and Design Considerations of Ni_{19.5}Ti_{50.5}Pd₂₅Pt₅ High-Temperature Shape Memory Alloy Helical Actuators" 2010, *Journal of Intelligent Material Systems & Structures* 20:17 2107-2126.

Invited Papers and Presentations

Keynote & Plenary Lectures

1. Stebner, A. "Mechanics of the Interactions Between Elasticity, Phase Transformation, and Plasticity in NiTi" May 2014, ASM International Shape Memory and Superelastic Technologies Conference, Pacific Grove, CA.

Workshop/Short-Course Lectures

2. Stebner, A. "Twinning, Phase Transformation, and Mesoscale Diffraction Mechanics" Feb. 2015 Los Alamos Neutron Scattering School, Los Alamos, NM.
3. Stebner, A. "Shape Memory Alloys and Actuation Applications" Jan. 2015, Honeywell Technology Learning Series, Phoenix, AZ.
4. Stebner, A. "In-situ Neutron Diffraction for Advancing Constitutive Models of Shape Memory Alloys" Nov. 2014, European Spallation Source Workshop, Prague, CZ.
5. Stebner, A. "Micro and Macro Mechanics of NiTi Deformation" February 2012, Medtronic Nitinol Workshop, Mounds View, MN.

Invited Presentations & Papers

6. Stebner, A. "Studying the Micromechanics of Martensitic Phase Transformations using High Energy Diffraction Microscopy", June 2015, CHESS User Group Meeting, Ithaca, NY.
7. Stebner, A. "Nickel-Titanium-Hafnium Alloys with High Strength and Advanced Functional Performances", Feb. 2015, Sandia National Laboratories, Albuquerque, NM.
8. Stebner, A. "Nickel-Titanium-Hafnium Alloy with High Strength and Superelasticity", Feb. 2015, University of Minnesota Mechanics Seminar, Minneapolis, MN.
9. Stebner, A. "In-situ Diffraction for Advancing Constitutive Models of Shape Memory Alloys", Dec. 2104, MRS, Boston, MA.
10. Stebner, A. "Unique Deformation Mechanisms of an Ultra-High Strength NiTiHf Alloy", Sept. 2014, Society of Engineering Sciences Meeting, West Lafayette, IN.
11. Stebner, A. "In-situ Neutron Diffraction for Advancing Constitutive Models of Shape Memory Alloys" June 2014, American Conference on Neutron Scattering, Knoxville, TN.
12. Stebner, A. "Invertible Design of Nitinol Biomedical Implants" April 2014, Medtronic, Mounds View, MN.

13. Stebner, A. "Mechanics of the Interactions Between Elasticity, Phase Transformation, and Plasticity in Metals" November 2013, Army Research Laboratory, Aberdeen, MD.
14. Stebner, A. "Mechanics of the Interactions Between Elasticity, Phase Transformation, and Plasticity in Metals" November 2013, Colorado School of Mines Metallurgical and Materials Engineering Colloquium, Golden, CO.
15. Stebner, A. "Mechanics of the Interactions Between Elasticity, Phase Transformation, and Plasticity in Metals" March 2013, Brown University Mechanics Colloquium, Providence, RI.
16. Stebner, A. "Mechanics of the Interactions Between Elasticity, Phase Transformation, and Plasticity in Metals" March 2013, Colorado School of Mines ME Colloquium, Golden, CO.
17. Stebner, A. "Micromechanics of NiTi Deformation: Neutron Diffraction Studies" October 2012, Nitinol Devices and Components, Fremont, CA.
18. Stebner, A. "Mechanics of the Interactions Between Elasticity, Phase Transformation, and Plasticity in NiTi" March 2012, Ohio State University, ME Colloquium, Columbus, OH.
19. Stebner, A. "Mechanics of the Interactions Between Elasticity, Phase Transformation, and Plasticity in NiTi" March 2012, Lehigh University, ME Colloquium, Bethlehem, PA.
20. Stebner, A. "Mechanics of the Interactions Between Elasticity, Phase Transformation, and Plasticity in NiTi" March 2012, Massachusetts Institute of Technology, Aerospace Colloquium, Cambridge, MA.
21. Stebner, A. and Brinson, L.C. "Recovered and Unrecovered Deformations of NiTi Martensite" December 2011, California Institute of Technology, Pasadena, CA.
22. Stebner, A. Brinson, L.C. Jiang, T. Olson, G.B. "Multiscale Modeling, Characterization, and Design of Shape Memory Alloys and Their Applications" September 2011, International Conference on Martensitic Transformations, Osaka, Japan.
23. Stebner, A. "Neutron Diffraction and Multivariant Modeling of Ni_{49.9}Ti_{51.1} Martensite" September 2011, Japan National Institute of Materials Science, Tsukuba, Japan.
24. Stebner, A. "Neutron Diffraction Studies and Multivariant Simulations of Shape Memory Alloys" July 2011, Gordon-Kenan Research Seminar, Easton, MA.
25. Stebner, A. "Multi-scale Modeling, Characterization, and Design of Shape Memory Alloys and Their Applications" April 2011, NASA Glenn Research Center.
26. Stebner, A. Brinson, L.C. "Multi-scale Modeling of Shape Memory Alloys" Mar 2011, Steel Researchers Group Meeting, Evanston, IL.
27. Stebner, A. Jiang, T "Concurrent Design of Automotive Shape Memory Alloys and Actuators" June 2010, Northwestern University Predictive Science and Engineering Design Symposium, Evanston, IL.
28. Stebner, A. Brinson, L.C. "Concurrent Design of Automotive Shape Memory Alloys and Actuators" March 2010, Steel Research Group Meeting, Evanston, IL.
29. Benefan, Brinson, Calkins, Chemisky, Hartl, Lagoudas, Padula, Seleecke, Stebner, Turner "Development of Frameworks for Comparing Shape Memory Alloy Models: Macro-scale Phenomenological Continuum Models" Sep 2011, ASME Conference on Smart Materials, Adaptive Structures, and Intelligent Systems, Phoenix, AZ.
30. Benefan, Brown, Calkins, Hartl, Stebner, Turner, Vaidyanathan, Webster, Young "Shape Memory Alloy Actuator Design: CASMART Collaborative Best Practices" Sep 2011, ASME Conference on Smart Materials, Adaptive Structures, and Intelligent Systems, Phoenix, AZ, SMASIS2011-5237.

Funded Research Programs

1. \$500,000 (100%) – CAREER: In-situ Advancements for Study of Multi-axial Micromechanics of Solid Materials, NSF-CMMI/MOMS, 2015-2020
2. \$120,000 (100%, pending) – Multi-axial Micromechanics of Magnesium Alloys, Army Research Laboratory, 2014-2015
3. \$35,000 (100%, pending) – Finite Element Modeling of NiTiHf Shape Memory Alloy Actuators, Boeing, 2015
4. \$19,422 (100%) – Twin and Habit Plane Morphologies of a NiTiHf High Temperature Shape Memory Alloy, NASA, 2013
5. \$19,916 (100%) – Orientation-Specific, Maximum Recoverable Strains of Novel Shape Memory alloys, NASA, 2013

Courses Taught

Graduate

1. MEGN-517 Inelastic Constitutive Relations (was MEGN-598 Nonlinear Solid Mechanics)
2. MEGN-513 Continuum Mechanics (was MEGN-598 Continuum Mechanics)

Undergraduate

1. MEGN-498 Engineering With Smart Materials
2. MEGN-481 Machine Design
3. DSGN-106 Engineering Design and Communication (Northwestern)
4. DSGN-298/398 Interdisciplinary Design Projects, Faculty Advisor (Northwestern)

Advising

Postdoctoral Scholars

1. Harshad Paranjape 2014 -

Ph.D. Students

1. Ashley Bucsek (NSF Graduate Fellowship Award) 2013 -
2. Garrison Hommer 2013 -
3. Luis Ham Villa (CONACYT Graduate Fellowship Award) 2014 -
4. Jinesh Dahal 2015 -

M.S. Students

1. Paul Paradise 2013 - 2015
2. Alex Sundby 2013 - 2015

Undergraduates

1. Dhwanil Shukla (Caltech SURF) Summer 2013
2. Shashank Argarwal (Caltech SURF) Summer 2013
3. Jin Yang (Caltech Visiting Scholar) 2012-2013
4. Joseph Kreuger (Northwestern Visiting Scholar) Summer 2010

Ph.D. Committee Member

1. Partha Paul (Northwestern University)
2. Steve Van Hall (Colorado School of Mines)
3. Blake Whitley (Colorado School of Mines)
4. Pingping Zhu (Northwestern University)

Outreach

Consortium for the Advancement of Shape Memory Alloy Research and Technology (CASMART) Student Shape Memory Alloy Design Competition

Organizer & Advisor of 5 Student Teams 2014-Present

Junior Science Café – Featured Scientist (Evanston Public Library)

“Morphing Aircraft and Other Cool Transformers,” class for middle & high school students through Northwestern “Science in Society” program Jan 2011

<i>Materials Research Science and Engineering Center Speaker (Northwestern)</i>	
“Speaking Through Science” Lectures:	
Evanston H.S.	June 2010
Truman College	Oct 2010
<i>Willard Residential College Graduate Associate (Northwestern)</i>	
SMA Fireside Lecture	Oct 2010
<i>Slivka Residential College Faculty Speaker (Northwestern)</i>	
SMA Fireside Lecture	March 2010

Professional Service and Membership

<i>International Conference on Martensitic Transformations</i>	
Advisory Board Member	2014-Present
Conference Chair	2017
<i>ASM International Organization on Shape Memory and Superelastic Technologies</i>	
Conference Chair	2017
President	2015-Present
Board Member	2012-Present
Conference Symposium Organizer	2013,2014
Member	Since 2010
<i>Synchrotron Service</i>	
CHESS Scientific Review Committee	2014 - Present
<i>Neutron Source Service</i>	
Oak Ridge SNS Scientific Review Committee	2015
NIST Instrumentation Advisory Panel, Gaithersburg	Aug 2014
European Spallation Source Workshop Invited Speaker	Nov 2014
<i>Consortium for the Advancement of Shape Memory Alloy Research & Technology (CASMAART)</i>	
Student Design Competition Organizer & Advisor	2014-Present
Design Group Member	2009-Present
Modeling Group Leader	2009-2011
Founding Member	2006-Present
<i>Colorado School of Mines Service</i>	
Mechanical Engineering Faculty Search Committee Member	2014-2015
Mechanical Engineering Graduate Council Representative	2015
Materials Science Graduate Student Recruiting Committee	2014-Present
<i>Proposal Panels/Reviews</i>	
National Science Foundation (Arctic Natural Sciences Program, Mechanics of Materials & Structures)	2015
Research Grants Council of Hong Kong	2015
Kentucky Science & Engineering Foundation	2015
American Chemical Society	2012
<i>Journal Peer Reviewer</i>	
National Science Foundation, American Chemical Society, Acta Materialia, Advanced Engineering Materials, J. Mechanics and Physics of Solids, Mechanics of Materials, Metallurgical Transactions A. (Outstanding Reviewer Certificate 2014), Intermetallics, Materials Science & Engineering A, J. Intelligent Material Systems & Structures, J. Materials Engineering and Performance, J. Alloys and Compounds, JOM, Smart Materials and Structures, Shape Memory and Superelasticity, ICOMAT Proceedings, SMST Proceedings.	Since 2010

<i>American Society of Mechanical Engineers</i>	
Smart Materials, Adaptive Structures, and Intelligent Systems Session Co-Organizer	2011
Member	Since 2005
<i>Tau Beta Pi</i>	
Member	
Ohio Kappa Chapter Scholarship Committee: 2005 Secretary, 2006 Chair	Since 2005
<i>Society of Automotive Engineers</i>	
Member	Since 2004
University of Akron Supermileage Team Member	2004-2005
<i>TMS</i>	
Member	Since 2011

Popular Press

NSF-Career Award Featured on CHESS Website
<http://news.chess.cornell.edu/articles/2015/Fontes150213.html>

NSF-Career Award Announced on Mines Newsroom
<http://www.minesnewsroom.com/press-releases/stebner-awarded-2015-nsf-career-award>

Feature Biography in McCormick Magazine – “Changing Shapes”
<http://www.mccormick.northwestern.edu/magazine/spring-2012/changing-shapes.html>

Chicago Tribune & Science in Society Interviews
<http://triblocal.com/evanston/community/stories/2011/01/science-connections-morphing-aircraft-and-other-cool-transformers/>
<http://scienceinsociety.northwestern.edu/content/articles/2011/morphing-aircraft-and-other-cool-transformers>

Cardiovascular Trainer for Wheelchair Users Featured in McCormick News:
http://www.mccormick.northwestern.edu/news/articles/article_1017.html

Shape Memory Alloy Oxygen Mask Deployment Featured on Segal Website:
<http://www.segal.northwestern.edu/news/2011/may/17/edc-students-design-mechanism-replace-pneumatic-cylinders-used-airplanes-emergency-systems/>

Green Energy Systems for Grant Park Featured on Segal Website:
<http://www.segal.northwestern.edu/news/2011/apr/28/edc-students-prepare-environmentally-friendly-and-educational-system-chicagos-millennium-park/>

Solar Powered, SMA Driven Pest Deterrents Featured on Segal Website:
<http://www.segal.northwestern.edu/news/2011/may/04/edc-students-use-smart-materials-make-next-generation-green-technology/>