

# Brian T. Lester

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## EDUCATION:

**Doctor of Philosophy**, Aerospace Engineering (3.94/4.0) (2009-Present)

*Texas A&M University, College Station, TX*

- Thesis Chair: Dr. Dimitris C. Lagoudas
- Thesis Committee Members: Drs. Ibrahim Karaman, John Whitcomb, Miladin Radovic and Siddiq Qidwai
- Dissertation Topic: “Modeling of SMA Ceramic Composites”
- Awarded NSF IGERT Fellowship (August 2011 – August 2012)
- Awarded Sandia National Laboratories (SNL)/Texas A&M University (TAMU) Excellence in Engineering Fellowship (August 2012)

**Bachelor of Science**, Aerospace Engineering (3.55/4.00) (2004-2009)

*University of Illinois at Urbana-Champaign, IL*

- Graduated with Honors

## PROFESSIONAL EXPERIENCE:

**Texas A&M University ▪ College Station, TX**

*Graduate Research Assistant*

(Fall 2009- Present)

- Current research involves micromechanical modeling of hybrid Shape Memory Alloy (SMA) – MAX phase ceramic ( $Ti_2AlC$ ) composites. Efforts related to this effort include development and implementation of a constitutive model describing the inelastic behavior of MAX phases and micromechanical schemes to determine the effective composite behavior. The effect of microstructure on the composite response is being explored through image-based modeling techniques including microstructure characterization through microtomography.

**Sandia National Laboratories ▪ Albuquerque, NM**

*Graduate Intern*

(Summer 2013)

- Efforts include the implementation of SMA constitutive material routines into in-house finite element routines. These routines were then used to simulate and analyze the response of SMA test specimens.

**Naval Research Laboratory ▪ Washington, D. C.**

*Visiting Research Assistant; Materials Engineer, Level II*

(Summers 2010; 2011)

- Investigated computational analysis and design of the microstructure of multifunctional SMA-MAX phase composites. Finite element meshes of exact microstructures of such composites were developed from x-ray tomography (XCMT) results and the microstructure was quantitatively analyzed using statistical 2-point correlations.

**University of Illinois ▪ Champaign, IL**

*Undergraduate Research Assistant*

(Summer 2009)

- Developed a finite element tool which minimized the noise related to Digital Image Correlation (DIC) results by enforcing equilibrium conditions.

## **Hamilton Sundstrand ▪ Rockford, IL**

*Engine Systems & Integrated Drive Generator Engineering Co-op* (Fall 2006-Spring 2007, Summer 2008)

- Supported existing and in-development product lines through tolerance and engineering analysis.
- Organized, performed, and analyzed development and optimization testing.

## RESEARCH INTERESTS:

- Multi-scale modeling and analysis of composites involving active materials (especially Shape Memory Alloys) using micromechanical and finite element techniques
- Constitutive modeling of inelastic materials (e.g. Shape Memory Alloys, MAX phase ceramics)
- Integrated computational analysis and design of material microstructures

## REFERRED JOURNAL PUBLICATIONS:

- **Lester, B. T.**, Chemisky, Y., and Lagoudas, D. C., 2011, “Effective Transformation Characteristics of SMA Composites”, *Smart Materials and Structures*, **20**, 094002.

## PAPERS IN CONFERENCE PROCEEDINGS:

- **Lester B. T.**, Chemisky Y., and Lagoudas, D. C., 2010, “Numerical Prediction of Effective Transformation Properties of Hybrid SMA-Ceramic Composites”, *Proceedings of the ASME 2010 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, September 28-October 1, 2010, Philadelphia, PA, USA.
- **Lester, B. T.**, Chemisky, Y., Geltmacher, A., Qidwai, S. M., and Lagoudas, D. C., 2011, “Virtual Processing of Hybrid SMA Composites through Martensitic Transformation”, *Proceedings of SPIE 2011 Conference on Smart Structures and Materials & Non-destructive Evaluation and Health Monitoring*, March 7-10, 2011, San Diego, CA, USA.
- **Lester, B. T.**, Chemisky, Y., Geltmacher, A. B., Qidwai, S. M., Everett, R. K., and Lagoudas, D. C. 2011, “Virtual Processing of Hybrid Shape Memory Alloy Composites”, *Proceedings of the ASME 2011 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, September 19-21, Scottsdale, AZ, USA.
- **Lester, B. T.**, Chemisky, Y., Geltmacher, A. B., Qidwai, S. M., Everett, R. K., and Lagoudas, D. C. 2011, “Hybrid Shape Memory Alloy Composites for Extreme Environments”, *Proceedings of the 22<sup>nd</sup> International Conference on Adaptive Structures and Technologies*, October 10-12, Corfu, Greece.
- **Lester, B. T.**, and Lagoudas, D. C., 2012, “Computational Micromechanical Modeling of Ceramic-SMA Composites”, *Proceedings of the 53<sup>rd</sup> AIAA Conference on Structures, Structural Dynamics and Materials*, April 23-25, Honolulu, HI.
- **Lester, B. T.**, and Lagoudas, D. C., 2012, “Modeling of Hybrid Shape Memory Alloy Composites Incorporating MAX Phase Ceramics”, *Proceedings of the ASME 2012 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, September 19-21, Stone Mountain, GA, USA.
- Tabesh, M., **Lester, B.**, Hartl, D., and Lagoudas, D., 2012, “Influence of the Latent Heat of Transformation and Thermomechanical Coupling on the Performance of Shape Memory Alloy Actuators”, *Proceedings of the ASME 2012 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, September 19-21, Stone Mountain, GA, USA.
- **Lester, B. T.**, and Lagoudas, D. C., 2013, “Modeling of Residual Stresses in Shape Memory Alloy – Ceramic Composites”, *Proceedings of the 54<sup>th</sup> AIAA Conference on Structures, Structural Dynamics and Materials*, April 8-11, Boston, MA, USA.

- **Lester, B. T.**, and Lagoudas, D. C., 2013, “Modeling of the Effective Actuation Response of SMA-MAX Phase Composites with Partially Transforming NiTi”, *Proceedings of the ASME 2013 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, September 16-18, Snowbird, UT, USA.

#### PRESENTATIONS:

- **Lester B. T.**, Chemisky Y., and Lagoudas D. C., 2010, “Numerical Prediction of Effective Transformation Properties of Hybrid SMA-Ceramic Composites”, *ASME 2010 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, October 1, Philadelphia, PA, USA.
- **Lester, B. T.**, Chemisky, Y., Geltmacher, A., Qidwai, S. M., and Lagoudas, D. C., 2011, “Virtual Processing of Hybrid SMA Composites through Martensitic Transformation”, *SPIE 2011 Conference on Smart Structures and Materials & Non-destructive Evaluation and Health Monitoring*, March 9, San Diego, CA, USA
- Lagoudas, D. C., **Lester, B. T.**, and Chemisky, Y., 2011, “Hybrid SMA Composites for Extreme Environments”, *Micromechanics & Modeling of Multifunctional Materials*, July 14-15, 2011, Thessaloniki, Greece (**Presented by D. C. Lagoudas**)
- **Lester, B. T.**, Chemisky, Y., Geltmacher, A. B., Qidwai, S. M., Everett, R. K., and Lagoudas, D. C., 2011, “Finite Element Modeling of Hybrid SMA Composites”, *US National Congress on Computational Mechanics 2011*, July 25-28, Minneapolis, MN USA (**Presented by: A. B. Geltmacher**)
- **Lester, B. T.**, Chemisky, Y., Geltmacher, A. B., Qidwai, S. M., Everett, R. K., and Lagoudas, D. C., 2011, “Virtual Processing of Hybrid Shape Memory Alloy Composites”, *ASME 2011 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, September 19-21, Scottsdale, AZ, USA
- **Lester, B. T.**, Chemisky, Y., Geltmacher, A. B., Qidwai, S. M., Everett, R. K., and Lagoudas, D. C., 2011, “Hybrid Shape Memory Alloy Composites for Extreme Environments”, *22<sup>nd</sup> International Conference on Adaptive Structures and Technologies*, October 10-12, Corfu, Greece
- Lagoudas, D. C., **Lester, B. T.**, and Chemisky, Y., 2011, “Modeling of Hybrid SMA-MAX Phase Composites for Extreme Environments”, *ASME 2011 International Mechanical Engineering Congress & Exposition*, November 16, Denver, CO (**Presented by D. C. Lagoudas**)
- **Lester, B. T.**, and Lagoudas, D. C., 2012, “Computational Micromechanical Modeling of Ceramic-SMA Composites”, *53<sup>rd</sup> AIAA Conference on Structures, Structural Dynamics and Materials*, April 23, Honolulu, HI, USA
- Parrinello, A. F., **Lester, B. T.**, and Lagoudas, D. C., 2012 “Computational Modeling of Hybrid SMA-Ceramic Composites”, *4<sup>th</sup> International Conference on Smart Materials, Structures and Systems (CIMTEC)*, June 10-14, Montecatini Terme, Italy (**Presented by A. F. Parrinello**)
- **Lester, B. T.**, Geltmacher, A. B., Qidwai, S. M., Everett, R. K., and Lagoudas, D. C., 2012, “3D Image-based Modeling of Residual Stresses in Hybrid Shape Memory Alloy/Ceramic Composites”, *1<sup>st</sup> International Conference on 3D Materials Science*, July 10, Seven Springs, PA, USA (**Presented by: A. B. Geltmacher**)
- **Lester, B. T.**, Qidwai, S. M., Geltmacher, A. B., Everett, R. K., and Lagoudas, D. C., 2012, “Image-based Modeling of Hybrid Shape Memory Alloy – MAX Phase Ceramic Composites”, *10<sup>th</sup> World Congress on Computational Mechanics*, July 10, Sao Paulo, Brazil (**Presented by: S. M. Qidwai**)
- Lagoudas, D. C., and **Lester, B. T.**, 2012, “Micromechanical Modeling of Hybrid SMA Composites”, *23<sup>rd</sup> International Congress on Theoretical and Applied Mechanics*, August 23<sup>rd</sup>, Beijing, China (**Presented by: D. C. Lagoudas**)
- **Lester, B. T.**, and Lagoudas, D. C., 2012, “Modeling of Hybrid Shape Memory Alloy Composites Incorporating MAX Phase Ceramics”, *ASME 2012 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, September 20<sup>th</sup>, Stone Mountain, GA, USA

- Tabesh, M., **Lester, B.**, Hartl, D., and Lagoudas, D., 2012, “Influence of the Latent Heat of Transformation and Thermomechanical Coupling on the Performance of Shape Memory Alloy Actuators”, *ASME 2012 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, September 20<sup>th</sup>, Stone Mountain, GA, USA (**Presented by: M. Tabesh**)
- **Lester, B. T.**, and Lagoudas, D. C., 2012, “Micromechanical Modeling of SMA-MAX Phase Composites”, *ASME 2012 International Mechanical Engineering Congress & Exposition*, November 12<sup>th</sup>, Houston, TX, USA
- Kothalkar, A., **Lester, B. T.**, Hu, L., Radovic, M., Karaman, I., and Lagoudas, D. C., 2013, “Experimental and Numerical Characterization of Hybrid Shape Memory Alloy (SMA) – MAX Phase Composites”, *TMS 2013 142<sup>nd</sup> Annual Meeting and Exhibition*, March, 7<sup>th</sup>, San Antonino, TX, USA (**Presented by: A. Kothalkar**)
- **Lester, B. T.**, and Lagoudas, D. C., 2013, “Modeling of Residual Stresses in Shape Memory Alloy – Ceramic Composites”, *54<sup>th</sup> AIAA Conference on Structures, Structural Dynamics and Materials*, April 10, Boston, MA, USA
- Lagoudas, D. C., and **Lester, B. T.**, 2013, “Modeling of Multifunctional Shape Memory Alloy – MAX Phase Ceramic Composites”, *8<sup>th</sup> Japanese-Mediterranean Workshop on Applied Electromagnetic Engineering for Magnetic, Superconducting, Multifunctional an Nano Materials*, June 24<sup>th</sup>, Athens, Greece (**Presented by: D. C. Lagoudas**)
- Lagoudas, D. C., **Lester, B. T.**, Cox, A., and Baxevanis, T., 2013, “Micromechanical Modeling and Analysis of Shape Memory Alloy Composite Materials at Different Scales”, *Society of Engineering Science 50<sup>th</sup> Annual Technical Meeting*, July 29<sup>th</sup>, Providence, RI, USA (**Presented by: D. C. Lagoudas**)
- **Lester, B. T.**, and Lagoudas, D. C., 2013, “Modeling of the Effective Actuation Response of SMA-MAX Phase Composites with Partially Transforming NiTi”, *ASME 2013 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, September 18th, Snowbird, UT, USA
- **Lester, B. T.**, and Lagoudas D. C., 2013, “Modeling of the Effective Actuation Response of SMA-MAX Phase Composites”, *24<sup>th</sup> International Conference on Adaptive Structures and Technologies*, October 7<sup>th</sup>, Aruba (**Presented by: D. C. Lagoudas**)

#### GRADUATE COURSEWORK:

- Continuum Mechanics (Dr. Dimitris Lagoudas)
- Continuum Thermodynamics (Dr. Kumbakonam Rajagopal)
- Fundamental Materials Science and Engineering (Dr. Xinghang Zhang)
- Introduction to Finite Elements (Dr. Fanis Strouboulis)
- Mathematical Foundations of Continuum Mechanics (Dr. Jay Walton)
- Mechanics of Active Materials (Drs. Dimitris Lagoudas and Darren Hartl)
- Methods of Applied Mathematics I (Dr. Goong Chen)
- Methods of Applied Mathematics II (Dr. Jay Walton)
- Micromechanics (Dr. Dimitris Lagoudas)
- Nanomechanics (Dr. Amine Benzerga)
- Nonlinear Finite Element Analysis (Dr. JN Reddy)
- Numerical Analysis (Dr. Bojan Popov)
- Plasticity Theory (Dr. Jim Boyd)
- Principles of Fluid Motion (Dr. Othon Rediniotis)
- Spacecraft Dynamics and Control (Dr. James Turner)
- Theory of Elasticity (Dr. Xin-Lin Gao)

### RELEVANT UNDERGRADUATE COURSEWORK:

- Finite Element Analysis (Dr. Philippe Geubelle)
- Mechanics of Composites (Dr. Nancy Sottos)

### SUPPLEMENTAL GRADUATE COURSEWORK:

- Completed IIMEC Winter School on “Computational Materials Science Across Scales” (January 2012)

### PROFESSIONAL SERVICE:

- Reviewer, *Smart Materials and Structures*, *IEEE Transactions on Control Systems Technology*
- Student Events Organizing Committee, ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems (2011,2012)
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### LEADERSHIP POSITIONS:

- Aerospace Engineering Graduate Student Council (May 2010 – May 2013)
- Graduate Student Council – Aerospace Engineering Representative (August 2010 – August 2011)
- Tau Delta Chapter of Pi Lambda Phi Fraternity
  - Recruitment Chair (Spring 2006)

### PROFESSIONAL SOCIETIES:

- American Institute of Aeronautics and Astronautics, Student Member (2009-Present)
- American Society of Mechanical Engineers, Student Member (2012-Present)

### SKILLS

#### *Computational*

- Computer Languages – Fortran, LaTeX, C++
- Software – Matlab, AutoCAD, Autodesk Inventor, ABAQUS (Including formal training)
- Operating Systems – Windows, Linux/UNIX, Mac
- Analysis of Shape Memory Alloy (SMA) materials through ABAQUS UMATs

#### *Experimental*

- MTS Hydraulic Test Frames (Uniaxial testing)
- Microstructure characterization through microtomography (XCMT)