

Fadi Abdeljawad

CONTACT INFORMATION 7427 Tricia RD NE Cell: (609) 216-6999
Albuquerque, NM 87113 Office: (505) 845-9080
E-mail: fabdelj@sandia.gov

CITIZENSHIP U.S.A.

CLEARANCE Active USA DOE Q-level

RESEARCH INTERESTS Theoretical and computational materials science; interface-driven phenomena; phase transitions; nanoscale physics; thermodynamics and kinetics of materials; computational thermodynamics; solid mechanics; mechanics of materials; atomistic, phase field and Monte Carlo methods; numerical analysis; and mathematical modeling.

EDUCATION **Princeton University**, Princeton, NJ, USA

Ph.D. in Mechanical & Aerospace Engineering 09/2008 - 01/2014
Thesis advisor: Professor Mikko Haataja

M.A. in Mechanical & Aerospace Engineering 09/2008 - 05/2010

North Carolina State University, Raleigh, NC, USA

B.S./M.S. in Mechanical & Aerospace Engineering 08/2001 - 12/2005

RESEARCH EXPERIENCE **Sandia National Laboratories**, Albuquerque, NM, USA

Senior Member of Technical staff 02/2016 - present
Computational Materials & Data Science Department

- Microstructural modeling of interface-driven phenomena (grain growth, sintering, coarsening, phase transitions).
- Mesoscale modeling of evolving morphologies in additively manufactured materials (metal powder-bed laser melting and ceramic direct ink write sintering).
- Atomistic studies of materials defect-defect interactions in metallic systems.

Sandia National Laboratories, Albuquerque, NM, USA

Postdoctoral Fellow 01/2014 - 01/2016
Computational Materials & Data Science Department

- Developing thermodynamic models of grain boundary solute segregation and phase transitions in nanocrystalline alloys.
- Examining grain boundary structural transitions and faceting instabilities.
- Mesoscale modeling of thermal grooving in polycrystalline thin films and the role on evolution under extreme conditions.

Princeton University, Princeton, NJ, USA

Ph.D. Research Assistant 09/2008 - 01/2014
Mechanical & Aerospace Engineering Department

Microstructural Modeling of Solid Oxide Fuel Cells (SOFCs)

- Develop a mesoscale model for the morphological evolution (coarsening) of the metallic phase in multi-phase SOFC anode microstructures.
- Quantify the effects of topological evolution on the electrochemical performance, long-term durability and phase stability of SOFC cells.
- Develop a continuum model for the deformation and mechanical damage accumulation due to reduction-oxidation (redox) cycles.

Inelastic Deformation of Bulk Metallic Glasses (BMGs)

- Develop a continuum model for the inelastic deformation and shear banding in BMGs.
- Quantify the enhancement in ductility through the formation of BMG composites.
- Analysis of martensitic transformations in mechanically deformed BMGs.

Sandia National Laboratories, Livermore, CA, USA

Graduate Student Intern

06/2012 - 09/2012

Mechanics of Materials Department

- Examine multi-physics FEM frameworks aiming to model hydrogen embrittlement in metals (coupled finite deformation-diffusion models).
- Develop a FEM localization element to model diffusion in cracks and shear bands.

North Carolina State University, Raleigh, NC, USA

Research Assistant

01/2004 - 12/2005

Mechanical & Aerospace Engineering Department

- Develop a framework to incorporate CSL grain boundary misorientations in continuum models of plasticity in FCC polycrystals.
- Examine the effects of grain boundary misorientation on the inelastic deformation of FCC polycrystals.

INDUSTRIAL
EXPERIENCE

Butler International/Sikorsky Aircraft, West Lafayette, IN, USA

Aircraft Structural Engineer

01/2006 - 07/2008

- The use of FEM and hand calculations to evaluate the structural integrity of the gearboxes for the newly designed Sikorsky CH-53K heavy lift helicopter.
- Develop 3D linear/nonlinear FEM models for the static, modal, crash and fatigue analysis of the intermediate and tail-rotor gearboxes.
- Work with engineers across several disciplines to ensure design feasibility.

PATENTS

N. Bell, T. Boyle, A. Cook and *F. Abdeljawad*, "Multi-component nanoinks for direct write applications", (US Appln. No.: 15/379,792, Filing Date: 12/15/2016, US Pub. No.: 2017-0181291).

RESEARCH
GRANTS

“Rapid Cycle Low Energy Processing for Fuel Cell Components.” DOE-EERE (under review) with Northeastern University, National Renewable Energy Laboratory and Advent Technologies, Inc. (Sandia PI, \$150k/year for three years).

“Microstructural evolution of polycrystalline thin metallic films under extreme conditions.” ASC-PEM, Sandia National Laboratories (PI, \$100k/year, 2016 - Present).

“Creating physically-based three-dimensional microstructures: Bridging phase field and crystal plasticity models.” Exploratory Express Laboratory Directed R&D, Sandia National Laboratories (co-PI with Corbett Battaile and Hojun Lim, \$100k/year, 2015 - 2017).

“A Synergistic approach to microstructural modeling and optimization of solid oxide fuel cells.” DOE EFRC student stimulus grant (\$10k, 2013).

Princeton University Dean’s Fund for Scholarly Travel: Financial support to present at the *MRS Spring Meeting*, San Francisco, CA (2013).

PUBLICATIONS

F. Abdeljawad, B. Uberuaga, E. Martinez, S. M. Foiles, “Grain boundary solute segregation in nanocrystalline materials: The role of anisotropy in segregation”, *In preparation (2017)*

F. Abdeljawad, D. Bolintineanu, A. Cook, H. Brown-Shaklee, D. Kammler, “Sintering kinetics in direct ink write additive manufacturing processes: A phase field study”, *In preparation (2017)*

J. Sestito, *F. Abdeljawad*, Y. Wang, “The role of grain boundary anisotropy in sintering kinetics: An atomistic simulation study”, *In preparation (2017)*

E. Popova, D. de Oca Zapiain, *F. Abdeljawad*, J. Foulk, S. Kalidindi, H. Lim, “Application of the materials knowledge systems framework to rank-order sensitivity to damage initiation in two-phase composites”, *Under review in Acta Mater. (2017)*

N. Argibay, T. Furnish, P. Lu, C. O’Brien, D. Adams, M. Chandross, J. Curry, T. Babuska, A. Kustas, B. Nation, *F. Abdeljawad*, M. Dugger, M. Rodriguez, S. Foiles, B. L. Boyce, C. A. Schuh, and B. Clark, “Achieving ultra-low wear with nanocrystalline metals”, *Under review in Nature Mater. (2017)*

M. Francois, A. Sun, W. King, N. Henson, D. Tournet, C. Bronkhorst, N. Carlson, C. Newman, T. Haut, J. Bakosi, J. Gibbs, V. Livescu, S. Vander Wiel, A. Clarke, M. Schraad, T. Blacker, H. Lim, T. Rodgers, S. Owen, *F. Abdeljawad*, J. Madison, A. Anderson, J.-L. Fattebert, R. Ferencz, N. Hodge, S. Khairallah, O. Walton, “Modeling of additive manufacturing processes for metals: Challenges and opportunities”, *Curr. Opin. Solid State Mater. Sci.* (In press, 2017). <https://doi.org/10.1016/j.cossms.2016.12.001>

F. Abdeljawad, P. Lu, N. Argibay, B. G. Clark, B. Boyce, and S. M. Foiles, “Grain boundary segregation in immiscible nanocrystalline alloys”, *Acta Mater.* **126**, 528 (2017)

D. L. Medlin, J. A. Zimmerman, *F. Abdeljawad*, K. Hattar, and S. M. Foiles, “Defect character at grain boundary facet junctions: Analysis of an asymmetric $\Sigma = 5$ grain boundary in Fe”, *Acta Mater.* **124**, 383 (2017)

J. Gruber, H. Lim, *F. Abdeljawad*, S. M. Foiles, and G. J. Tucker “Development of physically based atomistic microstructures: The effect on the mechanical response of polycrys-

tals”, *Comp. Mater. Sci.* **128**, 29 (2017) (*Editor’s choice*)

F. Abdeljawad, and S. M. Foiles, “Interface-driven phenomena in solids: Thermodynamics, kinetics and chemistry”, *J. Materials (JOM)* **68**, 1594 (2016)

F. Abdeljawad, D. L. Medlin, J. A. Zimmerman, K. Hattar, and S. M. Foiles, “A Diffuse interface model of grain boundary faceting”, *J. App. Phys.* **119**, 235306 (2016)

H. Lim, *F. Abdeljawad*, S. Owen, B. Hanks, C. C. Battaile, “Incorporating physically-based microstructures in materials modeling: Bridging phase field and crystal plasticity frameworks”, *Mod. Sim. Mat. Sci. Eng.* **24**, 045016 (2016)

D. C. Bufford, *F. Abdeljawad*, K. Hattar, and S. M. Foiles, “Unraveling irradiation induced grain growth with in situ TEM and coordinated modeling”, *App. Phys. Lett.* **107**, (2015)

F. Abdeljawad, and S. M. Foiles, “Stabilization of nanocrystalline alloys via grain boundary segregation: A diffuse interface model”, *Acta Mater.* **101**, 159 (2015)

F. Abdeljawad, B. Voelker, R. Davis, R. M. McMeeking, and M. Haataja, “Connecting microstructural coarsening processes to electrochemical performance in solid oxide fuel cells: An integrated modeling approach”, *J. Power Sources* **250**, 319 (2014)

R. Davis, *F. Abdeljawad*, J. Lillibridge, and M. Haataja, “Phase wettability and microstructural evolution in solid oxide fuel cell anode materials”, *Acta Mater.* **78**, 271 (2014)

A. Zaheri, *F. Abdeljawad*, and M. Haataja, “Simulation study of mechanical properties of bulk metallic glass systems: Martensitic inclusions and twinned precipitates”, *Model. Simu. Mater. Sci. Eng.* **22**, 085008 (2014)

F. Abdeljawad, and M. Haataja, “Microstructural coarsening effects on redox instability and mechanical damage in solid oxide fuel cell anodes”, *J. App. Phys.* **114**, 183519 (2013)

F. Abdeljawad, G. Nelson, W. Chiu, and M. Haataja, “Redox instability, mechanical deformation, and heterogeneous damage accumulation in solid oxide fuel cell anodes”, *J. App. Phys.* **112**, 036102 (2012)

F. Abdeljawad, M. Fontus, and M. Haataja, “Ductility of bulk metallic glass composites: Microstructural effects”, *App. Phys. Lett.* **98**, 031909 (2010)

F. Abdeljawad, and M. Haataja, “Continuum modeling of bulk metallic glasses and composites”, *Phys. Rev. Lett.* **105**, 125503 (2010)

F. Abdeljawad, and M. Zikry, “The effects of grain boundary orientations on failure behavior in F.C.C. polycrystalline systems”, *Int. J. Damage Mechanics* **18**, 341 (2009)

INVITED TALKS

F. Abdeljawad, “Mesoscale Modeling of Grain Boundaries: From Segregation Phenomena to Faceting Instabilities”, *Stony Brook University, Materials Science and Chemical Engineering Department Seminar*, (2017) New York, NY.

F. Abdeljawad, “Mesoscale Modeling of Materials Microstructures: From Sintering Kinetics to Grain Boundary Segregation”, *Empa: Swiss Federal Laboratories for Materials Science and Technology, Invited Department Seminar*, (2017) Zurich, Switzerland.

F. Abdeljawad, “Mesoscale Modeling of Grain Boundary Segregation and Faceting Instability in Nanocrystalline Materials”, *San Diego State University, Mechanical Engineering Department Seminar*, (2017) San Diego, CA.

F. Abdeljawad, S. M. Foiles, B. Boyce, K. Hattar, B. G. Clark, “Grain boundary segregation in immiscible alloys: A diffuse interface model”, *TMS 146th Annual Meeting and Exhibition*, (2017) San Diego, CA.

K. Hattar, D. C. Bufford, W. Mook, C. J. O’Brien, *F. Abdeljawad*, T. Furnish, B. Boyce, S. M. Foiles, “In-situ TEM observations of grain growth during high-cycle fatigue and notch fatigue”, *TMS 146th Annual Meeting and Exhibition*, (2017) San Diego, CA.

J. Gruber, *F. Abdeljawad*, H. Lim, S. M. Foiles, G. Tucker, “The development of physically based atomistic microstructure: The effect on the mechanical response of polycrystals”, *TMS 146th Annual Meeting and Exhibition*, (2017) San Diego, CA.

K. Hattar, D. Bufford, *F. Abdeljawad*, S. M. Foiles, “Exploring the role of texture, grain boundary character, and grooving on grain growth in metallic thin films”, *TMS 146th Annual Meeting and Exhibition*, (2017) San Diego, CA.

F. Abdeljawad, “Mesoscale modeling of grain boundaries: From segregation phenomena to faceting instabilities”, *University of Colorado - Colorado Springs, Mechanical & Aerospace Engineering Department Seminar*, (2016) Colorado Springs, CO.

S. M. Foiles, *F. Abdeljawad*, C. J. O’Brien, “Alloying effects on grain boundary motion and microstructure evolution”, *EMI conference*, (2016) Nashville, TN.

F. Abdeljawad, D. L. Medlin, J. A. Zimmerman, K. Hattar, and S. M. Foiles, “A mesoscale model of grain boundary faceting: The role of facet junctions”, *EMI conference*, (2016) Nashville, TN.

F. Abdeljawad, “Diffuse interface modeling of grain boundary segregation in metallic systems”, *The 2016 MACH conference*, (2016) Annapolis, MD.

S. M. Foiles, *F. Abdeljawad* and C. J. O’Brien, “Grain growth in alloys: Atomistic and phase field perspectives”, *SIAM Conference on Mathematical Aspects of Materials Science*, (2016) Philadelphia, PA.

M. Chandross and *F. Abdeljawad*, “Microstructural evolution of binary nanoparticle systems”, *TMS 144th Annual Meeting and Exhibition*, (2015) Orlando, FL.

F. Abdeljawad and M. Chandross, “Morphological evolution of metallic nanoparticles and the formation of core-shell structures: A phase field treatment”, *TMS 144th Annual Meeting and Exhibition*, (2015) Orlando, FL.

F. Abdeljawad, “Mesoscale modeling of interface-driven phenomena: From nanostructured alloys to solid oxide fuel cells”, *Materials Theory Seminar, Los Alamos National Laboratory*, (2014) Los Alamos, NM.

F. Abdeljawad, “Microstructural evolution, mechanical stability and performance of solid oxide fuel cell (SOFC) materials: A mesoscale modeling approach”, *Sandia National Laboratories*, (2013) Albuquerque, NM.

F. Abdeljawad, “Heterogeneous materials systems: From solid oxide fuel cells to metallic glass composites”, *GE Global Research*, (2013) Niskayuna, NY.

CONTRIBUTED
TALKS

F. Abdeljawad, D. Bolintineanu, A. Cook, H. Brown-Shaklee, D. Kammler, “A Mesoscopic Treatment of Sintering in Ceramics: Application to Direct Write Additive Manufacturing”, *2017 International Conference on Sintering*, (2017) San Diego, CA. (Upcoming)

B. Uberuaga, E. Martinez, W. Windl, L. Ward, F. Abdeljawad, “Atomistic and Mesoscale Modeling of Grain Boundary Segregation Part I”, *MRS Fall Meeting*, (2017) Boston, MA. (Upcoming)

F. Abdeljawad, S. M. Foiles, B. Uberuaga, E. Martinez, “Atomistic and Mesoscale Modeling of Grain Boundary Segregation Part II”, *MRS Fall Meeting*, (2017) Boston, MA. (Upcoming)

F. Abdeljawad, D. L. Medlin, J. A. Zimmerman, K. Hattar, S. M. Foiles, “A Mesoscale Model of Grain Boundary Faceting: The Role of Facet Junction Energetics”, *MRS Fall Meeting*, (2017) Boston, MA. (Upcoming)

F. Abdeljawad, D. Bolintineanu, A. Cook, H. Brown-Shaklee, D. Kammler, “Sintering Dynamics in Direct Write Additive Manufacturing Processes: A Phase Field Model”, *TMS 147th Annual Meeting and Exhibition*, (2018) Phoenix, AZ. (Upcoming)

F. Abdeljawad, S. M. Foiles, B. Uberuaga, E. Martinez, “Mesoscale modeling of Grain Boundary Segregation: The Role of Anisotropy in Segregation”, *TMS 147th Annual Meeting and Exhibition*, (2018) Phoenix, AZ. (Upcoming)

T. Rodgers, K. Johnson, F. Abdeljawad, J. Madison, “Comparison of 3D Microstructural Modeling for Powder Bed and Powder Fed Metal AM Methods”, *28th Solid Freeform Fabrication Symposium*, (2017) Austin, TX.

F. Abdeljawad, D. Bolintineanu, D. Kammler, H. Brown-Shaklee, A. Cook, “Diffuse Interface Modeling of Sintering, Grain Growth and Coarsening in Ceramics: Application to Additive Manufacturing”, *12th ACERS PACRIM Conference*, (2017) Waikoloa, HI.

F. Abdeljawad, P. Lu, N. Argibay, S. M. Foiles, “Grain boundary segregation in phase separating nanocrystalline alloys”, *APS March Meeting*, (2017) New Orleans, LA.

F. Abdeljawad, D. L. Medlin, J. A. Zimmerman, K. Hattar, and S. M. Foiles, “A mesoscale model of grain boundary faceting: The role of facet junctions”, *TMS 146th Annual Meeting and Exhibition*, (2017) San Diego, CA.

J. Trelewicz, H. Murdoch, and F. Abdeljawad, “Thermodynamic models for the design of stable nanocrystalline alloys”, *TMS 146th Annual Meeting and Exhibition*, (2017) San Diego, CA.

K. Hattar, D. C. Bufford, S. M. Foiles, F. Abdeljawad, “Exploring the role of texture, grain boundary character, and grooving on grain growth in metallic thin films”, *TMS 146th Annual Meeting and Exhibition*, (2017) San Diego, CA.

S. M. Foiles, P. Lu, C. J. O’Brien, N. Argibay, M. Chandross, F. Abdeljawad, B. G. Clark, and B. Boyce, “Grain boundary segregation in nanocrystalline alloys: Case study of

platinum-gold”, *Materials Science and Technology (MS&T)*, (2016) Salt Lake City, UT.

D. L. Medlin, K. Hattar, J. A. Zimmerman, *F. Abdeljawad*, and S. M. Foiles, “Investigating the interplay between grain boundary facet junctions and interfacial dislocations”, *Materials Science and Technology (MS&T)*, (2016) Salt Lake City, UT.

D. C. Bufford, *F. Abdeljawad*, S. M. Foiles, and K. Hattar, “Coupling In-situ transmission electron microscopy and phase field modeling to better understand grain growth in nanocrystalline metals”, *The 6th International Conference on Recrystallization and Grain Growth*, (2016) Pittsburgh, PA.

F. Abdeljawad, D. L. Medlin, J. A. Zimmerman, K. Hattar, and S. M. Foiles, “A diffuse interface model of grain boundary faceting”, *APS March Meeting*, (2016) Baltimore, MD.

F. Abdeljawad, D. C. Bufford, K. Hattar, and S. M. Foiles, “Experimental investigation and mesoscale modeling of irradiation-induced grain growth”, *MRS Spring Meeting*, (2016) Phoenix, AZ.

F. Abdeljawad, S. M. Foiles, and B. G. Clark, “Grain boundary segregation in phase separating nanocrystalline alloys: The role of competing processes on microstructure evolution”, *TMS 145th Annual Meeting and Exhibition*, (2016) Nashville, TN.

D. C. Bufford, *F. Abdeljawad*, S. M. Foiles, and K. Hattar, “In-situ characterization and phase field modeling of irradiation-induced grain growth”, *TMS 145th Annual Meeting and Exhibition*, (2016) Nashville, TN.

H. Lim, *F. Abdeljawad*, S. Owen, B. Hanks, and C. Battaile, “developing physically-based three dimensional microstructures: bridging phase field and crystal plasticity models”, *TMS 145th Annual Meeting and Exhibition*, (2016) Nashville, TN.

D. L. Medlin, K. Hattar, J. A. Zimmerman, *F. Abdeljawad*, and S. M. Foiles, “Experimental observations and modeling of interfacial defects at an asymmetric $\Sigma=5$ grain boundary in Fe”, *TMS 145th Annual Meeting and Exhibition*, (2016) Nashville, TN.

S. M. Foiles, *F. Abdeljawad* and C. J. O’Brien, “Grain boundary segregation: Atomistic and phase field treatments”, *Materials Science and Technology (MS&T)*, (2015) Columbus, OH.

J. A. Zimmerman, D. L. Medlin, *F. Abdeljawad*, K. Hattar, and S. M. Foiles, “Modeling and microscopy of defect character at grain boundary facet junctions in BCC Fe”, *Materials Science and Technology (MS&T)*, (2015) Columbus, OH.

S. M. Foiles, C. J. O’Brien and *F. Abdeljawad*, “Temperature dependence of grain boundary structure and motion”, *Materials Science and Technology (MS&T)*, (2015) Columbus, OH.

F. Abdeljawad and S. M. Foiles, “Grain boundary segregation and thermal stability of nanocrystalline alloys: A phase field approach”, *TMS 144th Annual Meeting and Exhibition*, (2015) Orlando, FL.

D. Medlin, K. Hattar, J. Zimmerman, *F. Abdeljawad*, and S. M. Foiles, “Defect character at grain boundary facet junctions: A combined HAADF-STEM and atomistic modeling study of an asymmetric $\Sigma = 5$ grain boundary in Fe”, *TMS 144th Annual Meeting and Exhibition*, (2015) Orlando, FL.

J. Berry, *F. Abdeljawad*, R. Davis, A. Hall, M. Haataja, “Physically-based modeling of redox reactions in SOFC anodes: Optimizing materials and microstructures for fracture resistance”, *TMS 144th Annual Meeting and Exhibition*, (2015) Orlando, FL.

F. Abdeljawad, and S. M. Foiles, “Grain boundary segregation as a route to stabilize nanocrystalline alloys: A phase field study”, *The 7th International Conference on Multiscale Materials Modeling (MMM)*, (2014) Berkeley, CA.

J. Berry, *F. Abdeljawad*, and M. Haataja, “Physically-based modeling of redox reactions and mechanical instability in SOFC anode materials”, *Materials Research Society (MRS) Spring Meeting*, (2014) San Francisco, CA.

F. Abdeljawad, and M. Haataja, “Mechanical stability of solid oxide fuel cell (SOFC) materials: A microstructure-based continuum modeling approach”, *TMS 143rd Annual Meeting and Exhibition*, (2014) San Diego, CA.

R. Davis, *F. Abdeljawad*, and M. Haataja, “Phase wettability and morphological evolution in solid oxide fuel cell anodes”, *TMS 143rd Annual Meeting and Exhibition*, (2014) San Diego, CA.

M. Chandross, P. Lu, T. Boyle, B. G. Clark, and *F. Abdeljawad*, “Bonding of metallic nanoparticles”, *The 2nd International Conference on Metallic Materials and Processing*, (2014) Las Vegas, NV.

F. Abdeljawad, R. Davis, and M. Haataja, “Topological evolution of SOFC electrode materials: A microstructural perspective”, *The Electrochemical Society (ECS) Meeting*, (2013) Toronto, Canada.

F. Abdeljawad, R. Davis, and M. Haataja, “Morphological evolution and microstructural stability of SOFC electrode materials: A phase-field study”, *Materials Research Society (MRS) Spring Meeting*, (2013) San Francisco, CA.

F. Abdeljawad, and M. Haataja, “Diffuse-interface modeling of evolving microstructures, stress evolution, and micro-cracking in solid oxide fuel cells”, *Materials Research Society (MRS) Spring Meeting*, (2012) San Francisco, CA.

W. Sun, J. Ostien, J. Foulk III, and *F. Abdeljawad*, “Modeling fluid flow in deformation bands with stabilized localization mixed finite elements”, *The American Geophysical Union (AGU) Fall Meeting*, (2012) San Francisco, CA.

A. Zaheri, *F. Abdeljawad*, and M. Haataja, “Phase-field simulation study of nucleation and propagation of shear bands in bulk metallic glasses with stress-induced precipitation of martensitic nanocrystals”, *TMS 141st Annual Meeting and Exhibition*, (2012) Orlando, FL.

F. Abdeljawad, M. Fontus, L. Manning, and M. Haataja, “Continuum modeling of bulk metallic glasses and composites”, *TMS 140th Annual Meeting and Exhibition*, (2011) San Diego, CA.

F. Abdeljawad, and M. Haataja, “A continuum model for bulk metallic glass composites”, *TMS 139th Annual Meeting and Exhibition*, (2010) Seattle, WA.

F. Abdeljawad, and M. Haataja, “A continuum model for bulk metallic glass composites”, *MAE Research Day*, (2009) Princeton, NJ. (1st place winner)

T. Kameda, M. Zikry, A. Rajendran, D. Brenner, and *F. Abdeljawad*, “Hierarchical modeling of failure mechanisms and grain boundary effects in nanocrystalline aggregates”, *Materials Research Society (MRS) Fall Meeting*, (2005) Boston, MA.

SERVICE TO
THE
COMMUNITY

- *Representative on behalf of the Functional Materials Division*: TMS Content Development and Dissemination Committee (2017 - present); TMS Membership and Student Development Committee (2017 - present).
- *Symposium co-organizer*: “Multiscale modeling of grain boundary structure, dynamics, and evolution.” *International Conference on Multiscale Materials Modeling (MMM)*, (2018) Osaka, Japan.
- *Symposium co-organizer*: “Computational method and experimental approaches for model development and validation, uncertainty quantification, and stochastic predictions.” *TMS 147th Annual Meeting and Exhibition*, (2018) Phoenix, AZ.
- *Symposium co-organizer*: “Thermal and mechanical stability of nanocrystalline materials.” *TMS 147th Annual Meeting and Exhibition*, (2018) Phoenix, AZ.
- *Symposium co-organizer*: “Computational methods and experimental approaches for uncertainty quantification and propagation, model validation, and stochastic predictions.” *TMS 146th Annual Meeting and Exhibition*, (2017) San Diego, CA.
- *Symposium organizer*: “Interface-driven phenomena in solids: Thermodynamics, kinetics and chemistry.” *TMS 145th Annual Meeting and Exhibition*, (2016) Nashville, TN.
- *Guest editor*: *Journal of Materials (JOM)*; the member journal of TMS (2016).
- *Symposium co-organizer*: “Microstructure-governed material deformation: Theoretical and computational methods, models and outcomes.” *The 13th US National Congress on Computational Mechanics (USNCCM13)*, (2015) San Diego, CA.
- *Journal referee*: *Modelling and Simulation in Materials Science and Engineering (MSMSE)*, *Acta Materialia*, *J. Materials Science*, *App. Phys. Lett.*, *Scientific Reports*, *J. of Materials Research (JMR)*, *J. Comp. Phys.*, *J. of Materials (JOM)*, *Computational Materials Science*, *Scripta Materialia*, *ASME International Mechanical Engineering Congress & Exhibition*.
- *Session chair*: “Computational Thermodynamics and Kinetics.” *TMS 146th Annual Meeting and Exhibition*, (2017) San Diego, CA; “Deformation and Transitions at Interfaces.” *TMS 146th Annual Meeting and Exhibition*, (2017) San Diego, CA.
- *Chair of organizing committee*: Princeton University Research Symposium (2011-2012).

MENTORING
ACTIVITIES

Graduate Summer Interns, Sandia National Laboratories

- Jesse Sestito, Georgia Institute of Technology. Summer 2017
- David Jacobson, University of Alabama. Summer 2017
- Jacob Gruber, Drexel University. Summer 2015

TEACHING
EXPERIENCE

Princeton University, Princeton, NJ, USA

- *Assistant in Instruction*: Modern Solid Mechanics. Fall 2011, Fall 2012
- *Assistant in Instruction*: Foundations of Applied Mathematics. Spring 2011
- *Assistant in Instruction*: Introduction to Materials Science. 2010
- *Assistant in Instruction*: Mechanical Design - Robotics. Spring 2010

North Carolina State University, Raleigh, NC, USA

- *Grader*: Finite Element Analysis. Fall 2004

AWARDS AND
HONORS

- TMS Young Leaders Professional Development Award - FMD Division. 2016
- The Francis Lothrop Upton Fellowship, Princeton University. 2008 - 2012
(Four-year academic and research excellence fellowship)
- The Martin Summerfield Fellowship, Princeton University. 2009 - 2010
(Fellowship awarded for research excellence)
- Nazemi award (1st in senior design project), NC state University. 2003
- Gordon & Louise Smith undergraduate scholarship, NC state University. 2001-2002

THESIS

F. Abdeljawad, "Mesoscale modeling of heterogeneous materials systems: From solid oxide fuel cells to bulk metallic glasses." *Ph.D. thesis, Princeton University*. 2014.

F. Abdeljawad, "Microstructural modeling of CSL grain boundary effects and crack growth in F.C.C. polycrystals." *M.S. thesis, North Carolina State University*. 2006.

PROFESSIONAL
SOCIETIES

- *Member*: The American Physical Society (APS). 2015 - present
- *Member*: Materials Research Society (MRS). 2011 - present
- *Member*: The Minerals, Metals and Materials Society (TMS). 2011 - present
- *Member*: The Electrochemical Society (ECS). 2012 - present
- *Member*: Graduate Engineering Council, Princeton University. 2010 - 2013
- *Student representative*: MAE Department, Princeton University. 2010 - 2012
- Sikorsky Helicopter Principles Certificate. 2007
- USA Defense Language Institute. 2006

COMPUTER
SKILLS

C, C++, MPI, FORTRAN, LAMMPS, Ovito, Paraview, ANSYS, Matlab, Tecplot, Mathematica, Maple, Linux, Mac OS X, Windows, LaTeX, MS Office.

REFERENCES

Professor Mikko Haataja (Ph.D. advisor)

Department of Mechanical and Aerospace Engineering
Princeton Institute for the Science and Technology of Materials
Princeton University
Olden St.
D404C Engineering Quad
Princeton, NJ 08544 USA
Email: mhaataja@Princeton.edu
Office: (609) 258-9126

Dr. Stephen M. Foiles (Postdoc advisor)

Distinguished Member of Technical Staff
Material, Physical, and Chemical Sciences Center
Sandia National Laboratories
Albuquerque, NM 87185
P.O. Box 5800 MS 1411
Email: foiles@sandia.gov
Office: (505) 844-7064

Professor Peter W. Voorhees (External Ph.D. committee member)

Department of Materials Science and Engineering
Department of Engineering Sciences and Applied Mathematics
Northwestern University
2220 Campus Drive
Cook Hall 2036
Evanston, IL 60208
Email: p-voorhees@northwestern.edu
Office: (847) 491-7815

Professor Craig Arnold (Ph.D. committee member)

Department of Mechanical and Aerospace Engineering
Director, Princeton Institute for the Science and Technology of Materials
Princeton University
Olden St.
D410 Engineering Quad
Princeton, NJ 08544 USA
Email: cbarnold@Princeton.edu
Office: (609) 258-0250

Dr. Brad Boyce

Distinguished Member of Technical Staff
Material, Physical, and Chemical Sciences Center
Sandia National Laboratories
Albuquerque, NM 87185
P.O. Box 5800 MS 0889
Email: blboyce@sandia.gov
Office: (505) 845-7525

Professor Philip Holmes (Teaching reference)

Department of Mechanical and Aerospace Engineering
Program in Applied and Computational Mathematics
Princeton University
Washington Road
275 PNI - Princeton Neuroscience Institute
Princeton, NJ 08544 USA
Email: pholmes@math.princeton.edu
Office: (609) 258-2958