CHRISTOPHER R. WEINBERGER

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EDUCATION

Stanford University *September 2009*
Ph.D. in Mechanical Engineering
Thesis Adviser: Prof. Wei Cai
Thesis: Dislocation Dynamics and Plasticity in Micropillars and Thinfilms

Stanford University *June 2005*
M.S. in Mechanical Engineering

Cal Poly San Luis Obispo *June 2001*
B.S. in Mechanical Engineering
Summa Cum Laude

PROFESSIONAL EXPERIENCE

Assistant Professor September 2013 - Present
Department of Mechanical Engineering & Mechanics *Philadelphia, PA*
Drexel University

Senior Member of the R&D S&E Staff September 2012 - August 2013
Department of Computational Materials Science & Engineering *Albuquerque, NM*
Sandia National Laboratories

- Developed multiscale models of plasticity in metals using both concurrent and hierarchical methods.
- Used atomistic simulations to understand oxidation of aluminum thin films.

Harry S. Truman Fellow August 2009 - September 2012
Department of Computational Materials Science & Engineering *Albuquerque, NM*
Sandia National Laboratories

- Investigated the process of dislocation nucleation and motion in nanocrystals using atomistic simulations
- Developed multiscale modeling techniques to simulate plasticity in BCC metals.
- Investigated mechanical deformation in refractory ceramics using density functional theory.

Graduate Research Assistant July 2004 - August 2009
Department of Mechanical Engineering *Stanford, CA*
Stanford University

- Developed techniques for the numerical simulation of crystal plasticity at the micro- and nano- scales using dislocation dynamics.
- Investigated the origins of size effects in single crystal micropillars using numerical simulations including dislocation dynamics and molecular dynamics.

Mechanical Engineer June 2001 - June 2005
Lockheed Martin Space Systems Company *Sunnyvale, CA*

- Worked as part of an integrated design team to produce parts for structural applications.
- Analyzed metal and composite structures for strength, stiffness, frequency and thermal distortions using finite element analysis.
- Provided analysis in support of tooling and ground support equipment design.

PUBLICATIONS

- Z. H. Aitken, D. Jang, C. R. Weinberger and J. R. Greer, Grain Boundary Sliding in Aluminum Nano-Bi-Crystals Deformed at Room Temperature, *Small*, In Press.
- B. L. Boyce, B. G. Clark, P. Lu, J. D. Carroll and C. R. Weinberger, The Morphology of Tensile Failure in Tantalum, *Metallurgical and Materials Transactions A* **44** (2013),4567.
- J.D. Carroll, B.G. Clark, T.E. Buchheit, B.L. Boyce and C.R. Weinberger, An Experimental Statistical Analysis of Stress Projection Factors in BCC Tantalum, *Materials Science and Engineering A* **581** (2013), 108.
- C. R. Weinberger, G. J. Tucker and S. M. Foiles, Peierls potential of screw dislocations in bcc transition metals: Predictions from density functional theory, *Physical Review B* **87** (2013), 3914.
- H. Lim, C. R. Weinberger, C. C. Battaile and T. E. Buchheit, Application of generalized non-Schmid yield law to low-temperature plasticity in bcc transition metals, *Modelling and Simulation in Materials Science and Engineering* **21** (2013), 045015.
- B. Wang, N. De Leon, C. R. Weinberger and G. B. Thompson, A Theoretical Investigation of the Slip Systems of Ta2C, *Acta Materialia* **61** (2013), 3914.
- N. De Leon, B. Wang, C. R. Weinberger and G. B. Thompson, Elevated Temperature Deformation Mechanisms in Ta2C: An Experimental Study, *Acta Materialia* **61** (2013), 3905.
- A. T. Jennings, C. R. Weinberger, S. W. Lee, Z. H. Aitken, L. Meza, and J. R. Greer, Modeling Dislocation Nucleation Strengths in Pristine Metallic Nanowires under Experimental Conditions, *Acta Materialia* **61** (2013), 2244.
- C. R. Weinberger, B. L. Boyce and C. C. Battaile Slip planes in BCC transition metals, *International Materials Review* **58** (2013), 296.
- G. J. Tucker, Z. H. Aitken, J. R. Greer and C. R. Weinberger The mechanical behavior and deformation of bicrystalline nanowires, *Modelling and Simulation in Materials Science and Engineering* **21** (2013), 015004.
- C. R. Weinberger and G. J. Tucker, Atomistic simulations of dislocation pinning points in pure face-centered-cubic nanopillars *Modelling and Simulation in Materials Science and Engineering* **20** (2012), 075001.
- A. T. Jennings, C. Gross, F. Greer, Z. H. Aitken, S.-W. Lee, C.R. Weinberger and J.R. Greer, Higher compressive strengths and the Bauschinger effect in conformally passivated copper nanopillars, *Acta Materialia* **60** (2012), 3444.
- C. R. Weinberger, C. C. Battaile, T. E. Buchheit, and E. A. Holm, Incorporating atomistic models of lattice friction into BCC crystal plasticity models, *International Journal of Plasticity* **37** (2012), 16.
- C. C. Battaile, B. L. Boyce, C. R. Weinberger, S. V. Prasad et al., The hardness and strength of metal tribofilms: an apparent contradiction between nanoindentation and pillar compression, *Acta Materialia* **60** (2012), 1712.
- C. R. Weinberger and W. Cai, Plasticity of Metal Nanowires, *Journal of Materials Chemistry* **22** (2012), 3277.
- C. R. Weinberger, A. T. Jennings, K. Kang, and J. R. Greer, Atomistic simulations and continuum modeling of dislocation nucleation and strength in gold nanowires, *Journal of the Mechanics and Physics of Solids* **60** (2012), 84.
- T. E. Buchheit, C. C. Battaile, C. R. Weinberger and E. A. Holm, Multiscale modeling of low temperature deformation in BCC metals,*JOM* **63** (2011), 33.
- C. R. Weinberger, The structure and energetics of, and the plasticity caused by, Eshelby dislocations, *International Journal of Plasticity* **27** (2011), 1391.
- C. R. Weinberger and W. Cai, The stability of LomerCottrell jogs in nanopillars, *Scripta Materialia* **64** (2011), 529.
- H. Zheng, A. Cao, C. R. Weinberger, J.Y. Huang et al., Discrete plasticity in sub-10-nm sized gold crystals, *Nature Communications* **1** (2010), 144.
- C. R. Weinberger, Dislocation drag at the nanoscale, *Acta Materialia* **58** (2010), 6535.

- C. R. Weinberger, Comment on Lattice Resistance to Dislocation Motion at the Nanoscale, *Physical Review Letters* **105** (2010), 099601.
- C. R. Weinberger and W. Cai, "Plasticity of metal wires in torsion: molecular dynamics and dislocation dynamics simulations," *Journal of the Mechanics and Physics of Solids* **58** (2010), 1011.
- C. R. Weinberger and W. Cai, Orientation dependent plasticity in metal nanowires under torsion: twist boundary formation and Eshelby twist, *Nano Letters* **10** (2010), 130.
- S. Ryu, C. R. Weinberger, M. I. Baskes, and W. Cai, Improved Modified Embedded-Atom Method Potentials for Gold and Silicon, *Modelling and Simulation in Materials Science and Engineering* **17** (2009), 075008.
- C. R. Weinberger, S. Aubry, S.-W. Lee, W. D. Nix and W. Cai, Modelling Dislocations in a Free-Standing Thin Film, *Modelling and Simulation in Materials Science and Engineering* **17** (2009), 075007.
- W. Cai and C. R. Weinberger, Energy of a Prismatic Dislocation Loop in an Elastic Cylinder, *Mathematics and Mechanics of Solids* **14** (2009), 192.
- W. Cai, W. Fong, E. Elsen and C. R. Weinberger, Torsion and Bending Periodic Boundary Conditions for Modelling the Intrinsic Strength of Nanowires, *Journal of the Mechanics and Physics of Solids* **56** (2008), 3242.
- C. R. Weinberger and W. Cai, Surface Controlled Dislocation Multiplication in Metal Micro-pillars, *Proceedings of the National Academy of Sciences* **105** (2008), 14304.
- J. R. Greer, C. R. Weinberger and W. Cai, Comparing the strength of f.c.c. and b.c.c. submicrometer pillars: Compression experiments and dislocation dynamics simulations, *Materials Science and Engineering A* **493** (2008), 21.
- C. R. Weinberger and W. Cai, Computing the Image Stress in an Elastic Cylinder, *Journal of the Mechanics and Physics of Solids* **55** (2007), 2027.
- W. Cai, A. Arsenlis, C. R. Weinberger, V. V. Bulatov, A non-singular continuum theory of dislocations, *Journal of the Mechanics and Physics of Solids* **54** (2006), 561.

PRESENTATIONS

Invited

- Christopher Weinberger, Hojun Lim , Jay Carrol, Corbett Battaile, Brad Boyce, "Finite Element Predictions of Grainscale Behavior in BCC Metals", keynote talk at USNCCM 12, July 2013.
- Christopher R. Weinberger, Lucas M. Hale, Hojun Lim et al., "Slip Planes in BCC Tantalum: Towards Resolving the Discrepancy Between Modeling and Experiments", keynote lecture at the International Symposium on Plasticity and Its Current Applications, January 2013.
- Christopher R. Weinberger, David M. Barnett and Wei Cai, "Eshelby Twist: Lots of Dislocations and Short Wires", Society of Engineering Sciences Annual Meeting, September 2012.
- Andrew T. Jennings, Garritt J. Tucker, Seok-Woo Lee, Christopher R. Weinberger and Julia R. Greer, "Modeling the Strength of Nanopillars and Nanowires", TMS Annual Meeting, March 2012.
- Nicholas De Leon, Billie Wang, Christopher R. Weinberger and Gregory B. Thompson, "High Temperature Deformation Mechanisms in Ta2C, International Symposium on Plasticity and Its Current Applications", January 2012
- Thomas E. Buchheit, Corbett C. Battaile, Christopher R. Weinberger, Brad L. Boyce and Elizabeth A. Holm, "Physically-Based Single Crystal and Polycrystal Models for Low-Temperature Plasticity in BCC Metals", International Mechanical Engineering Congress and Exposition, November 2011.
- Christopher R. Weinberger, "Atomistic Simulations of the Strength of Gold Nanowires", TMS Annual Meeting, March 2011.
- Christopher R. Weinberger, "The structure and energetics of, and the plasticity caused by, Eshelby dislocations", International Symposium on Plasticity and Its Current Applications, January 2011.
- Christopher R. Weinberger and Wei Cai, "Orientation Dependent Plasticity in Metal Nanowires under Torsion", International Symposium on Plasticity and Its Current Applications, January 2010.

Contributed

- Christopher R. Weinberger, Hojun Lim, Corbett C. Battaile, Thomas E. Buchheit and Elizabeth A. Holm, "Physically-Based Single Crystal and Polycrystal Models for Low-Temperature Plasticity in BCC Metals", International Mechanical Engineering Congress and Exposition, November 2012.
- Garritt J. Tucker, Zachary H. Aitken, Julia R. Greer and Christopher R. Weinberger, "Investigating the role of grain boundaries during the plastic deformation of bicrystalline nanowires using molecular dynamics", International Mechanical Engineering Congress and Exposition, November 2012.
- Corbett C. Battaile, Brad L. Boyce, Thomas E. Buchheit, Blythe G. Clark , Joe Michael, Somuri V. Prasad, and Christopher R. Weinberger, "Nanoindentation and Sub-Micro-Pillar Compression Tests on Nanocrystalline Nickel Tribofilms", International Mechanical Engineering Congress and Exposition, November 2012.
- Christopher R. Weinberger, Andrew T. Jennings and Julia R. Greer, "Atomistic and Continuum Simulations of Dislocation Nucleation in Gold Nanowires", MRS Fall Meeting, November 2011.
- Christopher R. Weinberger, "Dislocation Drag at the Nanoscale", MRS Fall Meeting, December 2010.
- Christopher R. Weinberger and Wei Cai, "Orientation Dependent Plasticity in Metal Nanowires under Torsion", TMS Annual Meeting, March 2010.
- Christopher R. Weinberger, William Fong, Erich Elsen and Wei Cai, "Torsion and Bending Simulations of Metallic Nanowires", MRS Fall Meeting, December 2008.
- Christopher R. Weinberger and Wei Cai, "Dislocation Dynamics and Plasticity in FCC and BCC Single Crystal Micro-Pillars", Dislocations 2008, October 2008.
- Christopher R. Weinberger, Keonwook Kang, Wei Cai, "Dislocation Dynamics in Micro and Nanoscale Cylinders", MRS Spring Meeting 2006.

TEACHING

ENGR 101: Engineering Design Laboratory I — Fall 2013
Drexel University — *Philadelphia, PA*

ME 80: Strength of Materials — Spring 2006
Stanford University — *Stanford CA*

Teaching Assistant — Winter 2005
Stanford University — *Stanford CA*
ME 340B Elasticity of Microscopic Structures

Math Workshop Facilitator — September 2000-June 2001
Cal Poly State University — *San Luis Obispo CA*

AWARDS AND HONORS

- Harry S. Truman Fellowship in National Science and Defense Engineering (2009-2012)
- Benchmark Stanford Graduate Fellowship
- Academic Excellence Award, Mechanical Engineering Department, Cal Poly San Luis Obispo
- Pi Tau Sigma, Mechanical Engineering Honor Society
- Tau Beta Pi, National Engineering Honor Society