

IAN DANIEL McCUE, PH.D.

Northwestern University
Department of Materials Science and Engineering
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EDUCATION

Ph.D. in Materials Science and Engineering Sep 2010 – Dec 2015

Johns Hopkins University

Thesis: Frontiers of Dealloying – Novel Processing for Advanced Materials

Advisor: Professor Jonah Erlebacher

B.S. in Materials Science and Engineering Sep 2006 – May 2010

Johns Hopkins University

EMPLOYMENT

Assistant Professor Sep 2021 –
Department of Materials Science and Engineering, Northwestern University

Adjunct Professor Jun 2020 – Aug 2021
Department of Materials Science and Engineering, Northwestern University

Senior Research Scientist Mar 2020 – Aug 2021
Research and Exploratory Development Department, JHU Applied Physics Laboratory

Postdoctoral Research Associate Sept 2018 – Mar 2020
Research and Exploratory Development Department, JHU Applied Physics Laboratory

Postdoctoral Research Associate Jun 2016 – August 2018
Department of Materials Science and Engineering, Texas A&M University

Graduate Research Assistant and Postdoctoral Research Associate Sep 2010 – Jul 2016
Department of Materials Science and Engineering, Johns Hopkins University

AWARDS AND HONORS

Invited Speaker, Gordon Research Conference – Structural Nanomaterials 2022
NASA Early Career Faculty 2021
REDD-X Imagine Award, Johns Hopkins University Applied Physics Laboratory 2020
Invited Speaker, Gordon Research Conference – Physical Metallurgy 2019
Materials Research Society Graduate Student Award, Silver 2014
Co-Chair, "Gordon Research Seminar on Thin Film and Crystal Growth Mechanisms" 2013
Donald S. Rodbell Fellowship, Johns Hopkins University 2011 – 2015

PUBLICATIONS

Bold: Ian McCue; Bold and Italics: Students in McCue Group

Refereed Journal Publications (total citations: 1477, h-index: 15)

- (29) G.M. Valentino, A. Banerjee, A. Lark, C.M. Barr, S.H. Myers, **I. McCue**, “Influence of Laser Processing Parameters on the Density-Ductility Tradeoff in Additively Manufactured Pure Tantalum” *Additive Manufacturing Letters*, 100117 (2022)
- (28) M.J Demkowicz, M. Liu, **I. McCue**, M. Seita, J. Stuckner, K. Xie, “Quantitative multi-image analysis in metals research” *MRS Communications*, 1-7 (**2022**)
- (27) A. Chuang, J. Baris, **C. Ott**, **I. McCue**, J. Erlebacher, “A powder metallurgy approach to liquid metal dealloying with applications in additive manufacturing” *Acta Materialia*, 238, 118213 (**2022**)
- (26) M. He, A. Banerjee, C.J. Marvel, **S. Price**, **I. McCue**, E.J. Schwalbach, K.J. Hemker, “Strong Impact of Minor Elements on the Microstructural Evolution of an Additively Manufactured Inconel 625 Alloy” *Metallurgical and Materials Transactions A*, 1-17, (**2022**)
- (25) **I. McCue**, J. Snyder, “How Can We Efficiently Fabricate Nanostructured Materials with Unprecedented Properties?” *Accounts of Materials Research*, (**2021**)
- (24) K.A. Small, **I. McCue**, K.S. Johnston, I.D. Donaldson, M.L. Taheri, “Precision Modification of Microstructure and Properties Through Laser Engraving,” *JOM*, (**2021**)
- (23) **I. McCue**, G.M. Valentino, D.B. Trigg, A.M. Lennon, C.E. Hebert, D.P. Seker, S.M. Number, J.M. Mastandrea, M.M. Trexler, S.M. Storck, “Controlled Shape-Morphing Metallic Components for Deployable Structures,” *Materials & Design*, **208** 109935 (**2021**)
- (22) C.E. Andrews, M.P. Chatham, S.F. Dorman, **I. McCue**, J.J. Sopcisak, M.L. Taheri, “Additive Manufacturing of NiZnCu-ferrite Soft Magnetic Composites,” *Journal of Materials Research*, (**2021**)
- (21) M. Liu, **I. McCue**, M.J. Demkowicz, “Quantifying Surface Deformation Around Micrometer-Scale Indents by Digital Image Correlation,” *Journal of Materials Research*, (**2021**)
- (20) **I. McCue**, S. Xiang, K. Xie, M.J. Demkowicz, “The Effect of Microstructure Morphology on Indentation Response of Ta/Ti Nanocomposites,” *Metallurgical Transactions A*, **51** (11), 5677-5690 (**2020**)
- (19) S. Xiang, **I. McCue**, D. Yadav, Y. Wang, J.K. Baldwin, M. Demkowicz, K. Xie “Comparative Study of He Bubbles in a Ti-Ta Alloy and a TiTa Nanocomposite,” *Philosophical Magazine Letters*, (**2020**)
- (18) **I. McCue**, C. Peitsch, T. Montalbano, A. Lennon, J. Sopcisak, M. Trexler, S. Storck, “Scalable Laser Powder Bed Fusion Processing of NiTi Shape Memory Alloy,” *MRS Communications*, **9** (4), 1214-1220 (**2019**)

- (17) Y. Zeng, B. Gaskey, E. Benn, **I. McCue**, G. Greenidge, K. Livi, X. Zhang, J. Jiang, J. Erlebacher, “Electrochemical Dealloying with Simultaneous Phase Separation,” *Acta Materialia*, **171**, 8-17 (**2019**)
- (16) B. Gaskey, **I. McCue**, A. Chuang, J. Erlebacher, “Self-Assembled Porous Metal-Intermetallic Nanocomposites via Liquid Metal Dealloying,” *Acta Materialia*, **164**, 293-300 (**2019**)
- (15) **I. McCue**, J. Stuckner, M. Murayama, M.J. Demkowicz, “Gaining new insights into nanoporous gold by mining and analysis of published images,” *Scientific Reports*, **8**, 6761 (**2018**)
*Paper featured on National Science Foundation homepage for impact on Materials Genome Initiative
- (14) **I. McCue**, A. Karma, J. Erlebacher, “Pattern Formation During Electrochemical and Liquid Metal Dealloying,” *MRS Bulletin*, 43 (1), (**2018**)
- (13) **I. McCue**, MJ Demkowicz, “Alloy design criteria for solid metal dealloying of thin films,” *JOM*, 69 (11), 1-7 (**2017**)
- (12) J. Stuckner, K. Frei, **I. McCue**, M.J. Demkowicz, M. Murayama, “AQUAMI: An open source Python package and GUI for the automatic quantitative analysis of morphologically complex multiphase materials,” *Computational Materials Science*, 139, 320-329 (**2017**)
- (11) **I. McCue**, B. Gaskey, B. Crawford, J. Erlebacher, “Local heterogeneity in the mechanical properties of bicontinuous composites made by liquid metal dealloying,” *Applied Physics Letters*, 109 (23), 231901 (**2016**)
- (10) **I. McCue**, B. Gaskey, P.-A. Geslin, A. Karma, J. Erlebacher, “Kinetics and morphological evolution of liquid metal dealloying,” *Acta Materialia*, 115, 10-23 (**2016**)
- (9) M. Seita, M. Volpi, S. Patala, **I. McCue**, C.A. Schuh, M.V. Diamanti, J. Erlebacher, M.J. Demkowicz, “A high-throughput technique for determining grain boundary character non-destructively,” *npj Computational Materials*, 2, 16016 (**2016**)
- (8) **I. McCue**, E. Benn, B. Gaskey, J. Erlebacher, “Dealloying and dealloyed materials,” *Annual Reviews of Materials Research*, 46 (1), 1.1–1.24 (**2016**)
- (7) **I. McCue**, S. Ryan, K. Hemker, X. Xu, N. Li, M. Chen, J. Erlebacher, “Size effects in the mechanical properties of bulk bicontinuous Ta/Cu nanocomposites made by liquid metal dealloying,” *Advanced Engineering Materials*, 18 (1), 46-50 (**2016**)
*Paper nominated and selected to be featured on Wiley’s news portal Materials Views
- (6) P.-A. Geslin, **I. McCue**, B. Gaskey, A. Karma, J. Erlebacher, “Topology-generating interfacial pattern formation during liquid metal dealloying,” *Nature Communications*, 6:8887 (**2015**)
- (5) X. Li, Q. Chen, **I. McCue**, J. Snyder, P. Crozier, J. Erlebacher, K. Sieradzki, “Dealloying of noble-metal alloy nanoparticles,” *Nano Letters*, 14 (5), 2569-2577 (**2014**)

- (4) J. Erlebacher, **I. McCue**, "Geometric characterization of nanoporous metals," *Acta Materialia*, 60 (17), 6164–6174 (**2012**)
- (3) **I. McCue**, J Snyder, X Li, Q Chen, K Sieradzki, J Erlebacher, "Apparent inverse Gibbs Thomson effect in dealloyed nanoporous nanoparticles," *Physical Review Letters*, 108 (22), 225503 (**2012**)
- (2) J. Snyder, **I. McCue**, K. Livi, J. Erlebacher, "Structure/Processing/Properties relationships in nanoporous nanoparticles as applied to catalysis of the cathodic oxygen reduction reaction," *Journal of the American Chemical Society*, 134 (20), 8633–8645 (**2012**)
- (1) J. Sun, O. Wilson, M. Reese, B.J. Jung, T. Dawidcyk, M. Yeh, B.M. Dhar, B.N. Pal, P. Trottman, **I. McCue**, L. Berger, G.R. Blum, E. Heinemann, D. McGee, J.D. Erlebacher, H.E. Katz, "Hands-on preparation and testing of solution-processed semiconductor devices in the undergraduate classroom," *Journal of Materials Education*, 31 (5), 271-284 (**2009**)

PRESENTATIONS

Department Seminars

Northwestern University, Materials Science and Engineering,	March (2021)
University of Illinois Urbana-Champaign, Materials Science and Engineering,	February (2021)
North Carolina State University, Materials Science and Engineering,	January (2021)
University of Washington, Department of Materials Science and Engineering,	April (2018)
University of Alabama, Department Metallurgical and Materials Engineering,	April (2018)
Stanford University, Department of Materials Science and Engineering,	March (2018)
University of Pennsylvania, Department of Materials Science and Engineering,	March (2018)
Arizona State University, School of Matter, Transport and Energy Engineering,	April (2017)
Texas A&M University, Department of Materials Science and Engineering,	November (2017)
UCLA, Department of Materials Science and Engineering,	April (2017)
Nanyang Technological University, Department of Mechanical Engineering,	March (2017)
North Carolina State University, Materials Science and Engineering,	September (2016)

Conference Oral Presentations

“*” denotes an invited presentation. Presenting author is underlined.

- (16) ***I. McCue**, “Self-Organizing Nanostructured Interlayers for Joining dissimilar metals,” *Structural Nanomaterials Gordon Research Conference*, Switzerland, May (**2022**)
- (15) **I. McCue**, J. Ko, Z. Xia, J. Snyder “Coarsening Mechanisms in Surface-doped Nanoporous Metals,” *TMS 2022*, Anaheim, CA February (**2022**)

- (14) **I. McCue**, Y. Li, Z. Xia, J. Snyder “Unveiling the Origin of Morphological Instability in Topologically Complex Electrocatalytic,” *TMS 2021*, virtual, February (**2021**)
- (13) **I. McCue**, J. Mastandrea, S. Storck, M. Trexler “Physics and Comparison of Complex Melt Flow And Defect Formation During Pulsed and Continuous Selective Laser Melting,” *TMS 2021*, virtual, February (**2021**)
- (12) **I. McCue**, M. Presley, M. Brupbacher, M. Trexler “Additive Manufacturing of Crack-free, W-base Refractory Materials,” *TMS 2020*, San Diego, CA, February (**2020**)
- (11) **I. McCue**, S. Storck, M. Trexler “Physics and Comparison of Complex Melt Flow And Defect Formation During Pulsed and Continuous Selective Laser Melting,” *TMS 2020*, San Diego, CA, February (**2020**)
- (10) ***I. McCue**, “Processing Insights from Data Science: Teaching Old Materials New Tricks,” *Physical Metallurgy Gordon Research Conference*, Biddeford, ME, July (**2019**)
- (9) ***I. McCue**, “Averting Plastic Flow Localization in Metal Nanocomposites by Tailoring Microstructure Morphology,” *Materials Research Society Spring Meeting*, Phoenix, AZ, April (**2018**)
- (8) **I. McCue**, M. Demkowicz, “Averting Plastic Flow Localization in Metal Nanocomposites by Tailoring Microstructure Morphology,” *TMS*, Phoenix, AZ, March (**2018**) ***Gold Presentation Award**, Ultrafine-grained Materials X
- (7) **I. McCue**, B. Gaskey, P.-A. Geslin, A. Karma, J. Erlebacher, “Kinetics of Morphological Evolution during Liquid Metal Dealloying” *Materials Research Society Fall Meeting*, Boston, Massachusetts, December (**2015**)
- (6) **I. McCue**, S. Ryan, K. Hemker, J. Erlebacher, “Bulk Bicontinuous Ta/Cu Nanocomposites Made by Liquid Metal Dealloying: Structure and Mechanical Properties,” *Materials Research Society Fall Meeting*, Boston, Massachusetts, December (**2015**)
- (5) **I. McCue**, S. Ryan, K. Hemker, X. Xu, N. Li, M. Chen, J. Erlebacher, "Hierarchical, Bicontinuous Refractory-Based Nanocomposites," *Materials Research Society Fall Meeting*, **Graduate Student Award Talk**, Boston, Massachusetts, December (**2014**)
- (4) **I. McCue**, S. Ryan, K. Hemker, X. Xu, N. Li, M. Chen, J. Erlebacher, "Hierarchical, Bicontinuous Refractory-Based Nanocomposites," *Materials Research Society Fall Meeting*, Boston, Massachusetts, December (**2014**)
- (3) **I. McCue**, S. Ryan, K. Hemker, X. Xu, N. Li, M. Chen, J. Erlebacher, "Mechanical Properties of Hierarchical Refractory-Based Nanocomposites," *First International Symposium on Nanoporous Materials by Alloy Corrosion*, Lake Bostol, Germany, September (**2014**)
- (2) ***I. McCue**, J. Erlebacher, "Dealloying and Fabrication of Porous Tantalum," *Gordon Research Conference in Thin Film and Crystal Growth*, Biddeford, Maine, July (**2013**)
*Abstract was selected to give oral presentation

- (1) **I. McCue**, J. Snyder, X. Li, Q. Chen, K. Sieradzki, and J. Erlebacher, "Apparent Inverse Gibbs-Thomson Effect in Dealloyed Nanoporous Nanoparticles," *Materials Research Society Fall Meeting*, Boston, Massachusetts, November (**2012**)

PATENT FILINGS

- (4) S. Stock, S. Rengaswamy, M. Brupbacher, **I. McCue**, "Reactive Additive Manufacturing of Metallic Matrix Composites with Ceramics," U.S. Patent Application No. 17/012,228, filed September (**2020**)
- (3) S. Storck, M. Trexler, A. Lennon, S. Nimer, C. Peitsch, **I. McCue**, "Localized Tailoring of Three-Dimensional Articles Via Additive Manufacturing," U.S. Patent Application Serial No. 16/937,897, filed July (**2020**)
- (2) J. Erlebacher, **I. McCue**, B. Gaskey, M. Brupbacher, "Nanostructured Thermal Spray Coatings," U.S. Provisional Patent Application No. 6245213, filed November (**2016**)
- (1) J. Erlebacher, **I. McCue**, "Nanostructured Composite Materials Containing Refractory Elements," U.S. Patent Application Serial No. 13/975,659 filed August (**2013**)

ADVISING AND MENTORING

Northwestern Postdoctoral Scholars

Jennifer Glerum, Department of Materials Science and Engineering (September 2022–present)
Hyeji Im*, Department of Materials Science and Engineering (April 2022–present)
*split 50% with David Dunand

Northwestern Ph.D. Students

Zhaoxi Cao, Department of Materials Science and Engineering (September 2020–present)
Luis Granadillo, Department of Materials Science and Engineering (September 2021–present)
Catherine Ott, Department of Materials Science and Engineering (September 2021–present)
Samuel Price, Department of Materials Science and Engineering (September 2021–present)
Abhinav Roy*, Department of Materials Science and Engineering (September 2022–present)
*co-advised with James Rondinelli

Northwestern M.S. Students

Alan Ramadhan, Department of Materials Science and Engineering (June 2022–December 2022)

Visiting Scholars

Wafa Houhamdi, Ecole Centrale de Nantes (April 2022–August 2022)

Northwestern Undergraduate Senior Project Mentoring

Aden Weiser, Department of Materials Science and Engineering (January 2023–present)
Souhardya Pal, Department of Materials Science and Engineering (September 2022–present)

FUNDING

Externally Funded Projects

Title: “**Design and Construction of a High throughput Oxidation Screening Test (HOST)**”

Source of Support: U.S. Army Research Laboratory; Award Period: 7/2022 to 7/2023

Amount: \$500K (to General Electric Research Division); **\$250K** (to Ian McCue, Northwestern PI; Jian Cao, Northwestern Co-PI; and Wei Chen, Northwestern Co-PI)

Person-Months Per Year Committed to Project: (0.32/YR1)

Title: “**Collaborative Research: Modeling Accelerated Development of Interface Engineered Tungsten Alloy Plasma Facing Materials**”

Source of Support: DOE FES; Award Period: 9/2022 to 9/2025

Amount: \$ (to Jason Trelewicz, Stony Brook University); **\$478K** (to Ian McCue, sole Northwestern PI)

Person-Months Per Year Committed to Project: (1/YR1; 1/YR2; 1/YR3)

Title: “**Development of Multi-Material Printing and Multi-Modal Sensing Capabilities for Directed Energy Deposition**”

Source of Support: NSF; Award Period: 9/2022 to 9/2024

Amount: **\$587K** (Ping Guo, PI; Ian McCue, Northwestern Co-PI; Jian Cao, Northwestern Co-PI)

Person-Months Per Year Committed to Project: (0.01/YR1)

Title: “**Collaborative Research: Compositional and Atomic-Scale Ordering Effects on Aqueous Passivation of Binary BCC and FCC Alloys**”

Source of Support: NSF DMR; Award Period: 8/2022 to 7/2025

Amount: \$ (to Karl Sieradzki, Arizona State University); **\$465K** (to Ian McCue, Northwestern PI; and James Rondinelli, Northwestern Co-PI)

Person-Months Per Year Committed to Project: (0.5/YR1; 0.5/YR2; 0.5/YR3)

Title: “**Stabilization of Silica Bubbles in Ultra High Temperature Ceramic Nanocomposites**”

Source of Support: AFOSR, Ming-Jen Pan (PM); Award Period: 7/2022 to 6/2025

Amount: **\$450K** (to Ian McCue, sole PI)

Person-Months Per Year Committed to Project: (1/YR1; 1/YR2; 0.5/YR3; 0.5/YR4)

Title: “**Self-Assembled Morphogenic Metal Coatings**”

Source of Support: DARPA DSO, Vishnu Sundaresan (PM); Award Period: 4/2022 to 3/2026

Amount: \$ (to Johns Hopkins University); **\$787K** (to Ian McCue, sole Northwestern PI)

Person-Months Per Year Committed to Project: (1/YR1; 1/YR 2; 1/YR 3; 1/YR4)

Title: “**Self-Organized Nanostructured Bonds through Transient Liquid Phase Dealloying**”

Source of Support: NASA Early Career Faculty; Award Period: 10/2021 to 10/2024

Amount: **\$600K** (to Ian McCue, sole PI)

Person-Months Per Year Committed to Project: (1/YR1; 0.5/YR2; 0.5/YR3)

PROFESSIONAL ACTIVITIES AND SERVICE

Conference Organization

Materials for Extreme Environments, Symposium Organizer Fall MRS (2023)
4th Symposium on Nanoporous Materials made *via* Corrosion, Symposium Co-organizer (2023)
Self-Organized Nanoarchitected Materials, Symposium Co-organizer TMS 2022 (2022)

Workshops

Attendee and Discussion Leader; NSF Workshop on Future Scientific Instruments for Alloys, Amorphous, and Composite Materials Research (November 7th&8th 2022)

Reviewer For:

Acta Materialia (outstanding reviewer award 2021), Corrosion Science, Journal of Electrochemical Society, JOM, Materials, Materials Research Letters, Metals, Modeling and Simulations in MSE, Nano Letters, Nature Communications, RCS Advances, Scientific Reports

UNIVERSITY ACTIVITIES AND SERVICE

Departmental Service

(2021-2022) Search Committee member, Junior Faculty Search; responsible for developing rubrics to ensure equitable and fair assessment of candidates

Ph.D. Student Thesis Committees

Lauren Walters, Materials Science and Engineering, Northwestern University (November 2022)
William Farmer, SEMTE, Arizona State University (April 2022)

Ph.D. Student Qualitative Assessment Committee

John Misiaszek, Department of Materials Science and Engineering, Northwestern (2022)
Samuel Pennell, Department of Materials Science and Engineering, Northwestern (2022)
Nicolas Alderete, Department of Mechanical Engineering, Northwestern (2022)
Christopher Hareland, Department of Materials Science and Engineering, Northwestern (2022)
Mythreyi Ramesh, Department of Materials Science and Engineering, Northwestern (2022)
Philip Staublin, Department of Materials Science and Engineering, Northwestern (2022)
Brandon Ohl, Department of Materials Science and Engineering, Northwestern (2022)
Zhongsheng Sang, Department of Mechanical Engineering, Northwestern (2021)
Tiffany Wu, Department of Materials Science and Engineering, Northwestern (2020)

TEACHING

Northwestern Graduate Courses

MAT_SCI 401, Statistical and Chemical Thermodynamics Sep 2022 – Dec 2022
MAT_SCI 401, Statistical and Chemical Thermodynamics Sep 2021 – Dec 2021

Northwestern Undergraduate Courses

MAT_SCI 332, Mechanical Behavior of Materials March 2022 – June 2022

NCAA Division III Assistant Fencing Coach, Johns Hopkins University Sep 2010 – Mar 2016

Responsibilities: designed and oversaw conditioning and skill exercises; gave individual private lessons; traveled with the team and coached at competitions
Contact: Austin Young, Head Coach, email: coachy@jhu.edu