

Eric J. Lang

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Curriculum Vitae

Overview:

Research Focus:

- Ion beam modification of materials and structural characterization using advanced microscopy techniques
- Investigating response of materials to extreme environments, including radiation, temperature, stress, oxidation

Research Output (as of August 2023):

- 58 total publications: 34 journal articles, 24 conference proceedings
- From Google Scholar: Citations 182; h-index: 6, i10-index: 5
- Presentations: Invited: 4; Total delivered: 13; Co-author: 14

Teaching Experience (as of August 2023):

- Classes taught: 3; classes assisted with: 1

Education

- **Doctor of Philosophy:** Nuclear, Plasma, and Radiological Engineering Department, University of Illinois – Urbana Champaign, January 2018-August 2020 (Graduation Date: December 2020)
Dissertation: “Deciphering the Role of Dispersoids in Dispersion-Strengthened Tungsten Alloys on the Mechanical Properties and Irradiation-Driven Response Under Nuclear Fusion Reactor-Relevant Conditions”
- **Master of Science:** Nuclear, Plasma, and Radiological Engineering Department, University of Illinois – Urbana Champaign, January 2016-December 2017
- **Bachelor of Science:** Engineering Physics, Minor in Mathematics, University of Illinois – Urbana Champaign, August 2012-December 2015. *GPA: 3.99/4.00*
- **High School Diploma:** Vernon Hills High School, Vernon Hills, IL, 2008-2012

Research and Professional Experience

- **University of New Mexico:** Assistant Professor, Nuclear Engineering Department, August 2022-Present
 - Assistant Professor in Nuclear Engineering Department at UNM
 - PI of the Lang Lab, investigating materials in extreme environments, with a focus on radiation damage, materials for fusion reactors and advanced fission reactors, and in-situ materials characterization
- **Sandia National Laboratories – Albuquerque:** Postdoctoral Appointee, Nanostructured Physics Division 1881, September 2020 – July 2022
 - Experimental researcher advised by Dr. Khalid Hattar.
 - Design and conduct research utilizing in-situ electron microscopy (SEM/TEM) characterization.
 - Support Center for Integrated Nano-Technologies (CINT) user research.

- Analysis of complex material systems under irradiation, heating, straining for advanced material development in extreme environments.
- **University of Illinois – Urbana Champaign:** Graduate Research Assistant, Radiation Surface Science and Engineering Laboratory, January 2016 – August 2020
 - Experimental researcher advised by Prof. Jean Paul Allain.
 - Conduct research on plasma-facing materials in nuclear fusion reactors.
 - Research focused on developing tungsten alloys via spark plasma sintering.
 - Samples characterized and analyzed for mechanical properties and performance under irradiation.
- **Oak Ridge National Laboratory:** Nuclear Engineering Science Laboratory Synthesis Intern, Materials Science and Technology Division, May 2018 – August 2018
 - Experimental researcher advised by Dr. Chad Parish and Dr. Lauren Garrison.
 - Conducted research on tungsten materials to be used in nuclear fusion reactors.
 - Research focused on electron microscopy and mechanical testing of specimens that had undergone neutron irradiation.
- **University of Illinois – Urbana Champaign:** Undergraduate Research Assistant, Department of Physics, May 2013-August 2015
 - Assisted Prof. Alan Nathan in research regarding the physics of baseball.
 - Investigated the trajectory of pitched and hit baseballs in Major League Baseball games through analysis of PITCHf/x, HITf/x, and Trackman data.
 - Analyzed data using R, SQL, and Microsoft Excel to determine drag coefficients for pitched baseballs and examine concept of 3D strike zone.
 - Findings published in *The Hardball Times* and presented at *Saberseminar 2015*.
 - Member of team that studied flight analysis and landing points of launched baseballs at Minute Maid Park. Findings published in *Baseball Prospectus*.
- **Trackman Baseball:** Data Analytics and Operations Intern, Stamford, CT, May 2015-August 2015
 - Reviewed and verified data from Trackman radar units in Major League Baseball and Minor League Baseball stadiums.
 - Analyzed and interpreted data regarding pitched and hit baseballs for in-house projects using R and Excel.

Served as Peer Reviewer for these journals:

- *Journal of Nuclear Materials, Nuclear Fusion, JOM, Materials Research Letters, Fusion Science and Technology, Nuclear Materials and Energy*

Funded Proposals/Contracts Since 2022

- PI: 2023-2025 DOE-NE NEUP RDO-1: Advanced Reactor Development “Deciphering Irradiation Effects of YHx through In-situ Evaluation and Micromechanics for Microreactor Applications”
- PI: 2023-2024 DOE-NE GSI-23: “Establishment of Hot Cell Irradiated Materials Micro and Nano-Mechanical Testing at the University of New Mexico, GSI: General Scientific Infrastructure”
- Co-PI: NRC Distinguished Faculty Advanced Program
- Co-PI: 2023-2025 DOE-NE NEUP NM-2 - Advanced Reactor Core or Structural Materials “Mechanism Driven Evaluations of Sequential and Simultaneous Irradiation-Creep-Fatigue Testing”
- PI: 2023-2025 SNL Contract for LDRD Tungsten Composites LDRD Project
- PI: 2023-2025 SNL Contract for LDRD 2D Materials LDRD Project

Proposal Agencies Submitted to Since 2022

- DOE-NE NEUP Consolidated Innovative Nuclear Research
- DOE-FES Reaching a New Energy Workforce (RENEW)
- DOE-NE NEUP Scientific Infrastructure Support
- DOE-EPSCoR
- U.S. Nuclear Regulatory Commission (NRC) Funding Opportunity Announcement (FOA), the University Nuclear Leadership Program, Scholarship and Fellowship Education Grant, Distinguished Faculty Advancement and Trade School and Community College Scholarship Grants

Proposals Reviewed (Institutes)

- DOE- Advanced Materials & Manufacturing Technologies Office (AMMTO)
- U.S. Nuclear Regulatory Commission (NRC)

Mentoring

- Served on 2 Masters and 1 PhD Committee
- Mentored 3 SNL student interns
- Mentored 4 UNM graduate students and 4 UNM undergraduate research assistants

Masters Committees

- Dylan Weathered, UNM
- Jared Justice, UNM

PhD Committees

- Yuqi Liu, UNM

UNM Graduate Research Assistants

- Christian Arguello
- Shane Evans
- Christine Kalogeras
- Ryan Pena

UNM Undergraduate Research Assistants

- Justin Hamil
- Alex Lascheid
- Kendall Trelue
- Schuyler Tyler

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- **Publications:**
 - 1. D. Lynes, J. Young, E. Lang, H. Chandralalim. *Impact of Silicon Ion Irradiation on Aluminum Nitride-Transduced Microelectromechanical Resonators*, **Advanced Material Interfaces** 2300240 2023.
 - 2. E. Lang, T. Clark, R. Schoell, K. Hattar, D.P. Adams. *In situ investigation of ion irradiation-induced amorphization of (Ge₂Sb₂Te₅)_{1-x}C_x [0 ≤ x ≤ 0.12]* **Journal of Applied Physics** 133 13 (2023).
 - 3. E. Lang, C.N. Taylor, N. Madden, T. Marchhart, C. Smith, X. Wang, J. Krogstad, J.P. Allain. *Examination of Early-Stage Helium Retention and Release in Dispersion-Strengthened Tungsten Alloys* **Fusion Science and Technology** (2023) 1-10.
 - 4. S. Srinivasan, E. Lang, K. Burns, K. Hattar, B.C. Hornbuckle, K.A. Darling, K. Solanki. *In-situ TEM bubble to cavity evolution due to annealing post helium and dual ion irradiation in Cu₁₀Ta and Cu-3Ta* **Materials Characterization** 113038 (2023).

- 5. A. Saefan, X. Liu, E. Lang, L. Higgins, Y. Wang, O. El-Atwani, J.P. Allain, X. Wang. *Effects of transition metal carbide dispersoids on helium bubble formation in dispersion-strengthened tungsten* **Scientific Reports** 13 (2023) 13352.
- 6. S.J. Dillon, Y. Ma, E. Lang, J. Ouyang, K. Hattar. *An interface nucleation rate limited sintering kinetic model applied to in situ sintering Al₂O₃-5wt%AlN composites* **Journal of the European Ceramic Society** 43 (2023) 3465-3474.
- 7. S. Stangebye, K. Ding, Y. Zhang, E. Lang, K. Hattar, T. Zhu, J. Kacher, O. Pierron. *Direct Observation of Grain-Boundary-Migration-Assisted Radiation Damage Healing in Ultrafine Grained Gold under Mechanical Stress* **Nano Letters** 23 8 (2023) 3282-3290.
- 8. M. Thomas, H. Salvador, T. Clark, E. Lang, K. Hattar, S. Mathaudhu. *Thermal and Radiation Stability in Nanocrystalline Cu* **Nanomaterials** 13 (2023) 1211.
- 9. K. Burns, A.M.Z. Tan, J.A. Hachtel, A. Aditya, N. Baradwaj, A. Mishra, T. Linker, A. Nakano, R. Kalia, E. Lang, R. Schoell, R.G. Hennig, K. Hattar, A. Aitkaliyeva. *Tailoring the Angular Mismatch in MoS₂ Homobilayers through Deformation Fields* **Small** 2300098 (2023).
- 10. L.M. Garrison, Y. Katoh, T. Hinoki, N. Hashimoto, J.R. Echols, J.W. Geringer, N.C. Reid, J.P. Allain, B. Cheng, D. Dorow-Gerspach, V. Ganesh, H. Gietl, S.A. Humphry-Baker, E. Lang, I. McCue, J. Riesch, L.L. Snead, G.D.W. Smith, J.R. Trelewicz, Y. Yang, S.J. Zinkle. *Review of Recent Progress in Plasma-Facing Material Joints and Composites in the FRONTIER US-Japan Collaboration* **Fusion Science and Technology** (2023) 1-9.
- 11. R. Schoell, A. Reyes, G. Suman, M. Nhu Lam, J. Hamil, S.G. Rosenberg, L. Treadwell, K. Hattar, E. Lang. *Hot Isostatic Pressing Control of Tungsten-Based Composites* **Inorganics** 11 (2023) 82.
- 12. E. Lang, T. Beechem, A. McDonald, T. Friedmann, R.H. Olsson III, J.O. Stevens, B.G. Clarke, K. Hattar. *Defect Structures as a Function of Ion Irradiation and Annealing in LiNbO₃* **Thin Solid Films**, 2023, 139719.
- 13. S.J. Dillon, E. Lang, S.C. Finkeldei, J. Ouyang, K. Hattar. *A Nucleation Rate Limited Model for Grain Boundary Creep* **Acta Materialia**, 2023, 118718.
- 14. C.M. Barr, E. Lang, K. Burns, P. Price, B.D. Miller, D.D. Keiser Jr., A. Aitkaliyeva, K. Hattar. *The Complex Structural and Chemical Nature of Monolithic U-10Mo Fuel and Zr Barrier Layer.* **Journal of Nuclear Materials**, 573, 2023, 154083.
- 15. E. Lang, N.M. Heckman, T. Clark, B. Derby, A. Barrios, A. Monterrosa, C.M. Barr, D.L. Buller, D.D. Stauffer, N. Li, B.L. Boyce, S.A. Briggs, K. Hattar. *Development of an In situ Ion Irradiation Scanning Electron Microscope.* **Nuclear Instruments and Methods in Physics Research B**, 527, 2023, 29-37.
- 16. O. Hussein, D.K. Coffman, K. Hattar, E. Lang, S.J. Dillon, F. Abdeljawad, *Plateau-Raleigh Instability with a grain boundary twist*, **Applied Physics Letters** 121 (14), 141601, 2022.
- 17. C.M. Smyth, J.M. Cain, E. Lang, P. Lu, X. Yan, S.E. Liu, J. Yuan, M.P. Bland, N.J. Madden, T. Ohta, V.K. Sangwan, M.C. Hersam, K. Hattar, S.S. Chou, T-M. Lu. *Resilience of monolayer MoS₂ memtransistor under heavy ion irradiation.* **Journal of Materials Research** 2022, 1-15.
- 18. E. Lang, K. Burns, Y. Wang, P.G. Kotula, A.B. Kustas, S. Rodriguez, A. Aitkaliyeva, and K. Hattar. *Compositional Effects of Additively Manufactured Refractory High-Entropy Alloys under High-Energy Helium Irradiation.* **Nanomaterials** 2022, 12, 2014. <https://doi.org/10.3390/nano12122014>.
- 19. C.A. Dennett, Z. Hua, E. Lang, F. Wang, B. Cui. *Thermal conductivity reduction in (ZrTaNbTi)C high entropy carbide from extrinsic lattice defects.* **Materials Research Letters**, 10 (9), 611-617 2021.
- 20. C.A. Taylor, D.B. Robinson, J.D. Sugar, E. Lang, C.M. Barr, Y. Wang, C.S. Snow, K. Hattar. *Microstructural Effects of High Dose Helium Implantation in ErD₂.* **Materialia** 2021, 101280.
- 21. E. Lang, C.A. Dennett, N. Madden, K. Hattar. *The In Situ Ion Irradiation Toolbox: Time-Resolved Structure and Property Measurements.* **JOM** 83 2021, 1-17.

- 22. K. Burns, P.C. Reuel, F. Guerrero, E. Lang, P. Lu, A. Aitkaliyeva, K. Hattar, T. Boyle. *Thermal Stability and Radiation Tolerance of Lanthanide-Doped Cerium Oxide Nanocubes*. **Crystals** 11 (11) 2021, 1369.
- 23. E.A. Scott, K. Hattar, E. Lang, A. Kiumars, J. Gaskins, P. Hopkins. *Displacement damage governed reductions in the thermal conductivity of irradiated silicon*. **Physical Review B** 104 (13) 2021, 134306.
- 24. C.A. Taylor, E. Lang, P.G. Kotula, R. Goeke, C.S. Snow, Y. Wang, K. Hattar. *Helium Bubbles and Blistering in a Nanolayered Metal/Hydride Composite*. **Materials** 14 (18), 2021, 5393.
- 25. J.M. Young, T.A. Byers, E. Lang, S. Singh, G.A. Glass, K. Hattar, B. Rout. *Synthesis of magnesiowüstite nanocrystallites embedded in an amorphous silicate matrix via low energy multiple ion implantations*. **Planetary and Space Science** 206, 105319.
- 26. E. Lang, A. Kapat, T.W. Morgan, J.P. Allain. *High Flux Helium Irradiation of Dispersion-Strengthened Tungsten Alloys and Effects of Heavy Metal Impurity Layer Deposition*. **Journal of Nuclear Materials** 152672.
- 27. E. Lang, H. Schamis, N. Madden, C. Smith, R. Kolasinski, J. Krogstad, J.P. Allain. *Recrystallization Suppression Through Dispersion-Strengthening of Tungsten*. **Journal of Nuclear Materials** 152613.
- 28. E. Lang, C.N. Taylor, J.P. Allain. *GD-OES study of the influence of second phase particles on the deuterium depth distribution in dispersion-strengthened tungsten*. **Journal of Nuclear Materials** 532 (2020) 152047.
- 29. A. Civantos, A. Barnwell, A. Shetty, J. Pavon, O. El-Atwani, S. Arias, E. Lang, L. Reese, M. Chen, J.P. Allain. *Designing Nanostructured Ti₆Al₄V Bioactive Interfaces with Directed Irradiation Synthesis toward Cell Stimulation to Promote Host-Tissue-Implant Integration*. **ACS Biomaterials Science and Engineering** 5, 7, (2019) 3325-3339.
- 30. E. Lang, N. Reid, L. Garrison, C. Parish, J.P. Allain. *Pre-irradiation comparison of W-based alloys for the PHENIX campaign: microstructure, composition, and mechanical properties*. **Fusion Science and Technology** 75, 533-541 (2019).
- 31. L. Garrison, Y. Katoh, W. Geringer, M. Akiyoshi, X. Chen, M. Fukuda, A. Hasegawa, T. Hinoki, X. Hu, T. Koyanagi, E. Lang, M. McAlister, J. McDuffee, T. Miyazawa, C. Parish, E. Proehl, N. Reid, J. Robertson, H. Wang. *PHENIX US-Japan Collaboration Investigation of Thermal and Mechanical Properties of Thermal Neutron Shielded Irradiated Tungsten*. **Fusion Science and Technology** 75, 499 (2019).
- 32. E. Lang, N. Madden, C. Smith, J. Krogstad, J.P. Allain. *Deciphering the role of second phase precipitates on early-stage surface morphology development of dispersion-strengthened W alloys under low energy He irradiation*. **Nuclear Materials and Energy** 19, 2019, 47-54.
- 33. L. Garrison, E. Lang, "Mechanical properties of tungsten irradiated in the PHENIX collaboration." *Fusion Materials Research at Oak Ridge National Laboratory in Fiscal Year 2018* **1072** (2018) 33-35.
- 34. E. Lang, N. Madden, C. Smith, J. Krogstad, J.P. Allain. *Microstructural and compositional effects of transition metal carbide additions on dispersion-strengthened W alloys fabricated via spark plasma sintering*. **International Journal of Refractory Metals and Hard Materials** 75, 2018, 279-286.
- 35. E. Lang, A. Kapat, J.P. Allain. *Deciphering surface behavior and deuterium retention in tin-lithium-coated fuzzy tungsten substrates*. **Nuclear Materials and Energy** 12, 2017, 1352-1357.

• **Conference Oral Presentations:**

- 1. E. Lang, S. Evans, K. Hattar, I. McCue, A. Kustas, M.A. Cusentino. "Refractory Composites

for Nuclear Environments: Design, Synthesis, and Extreme Environment Testing,” Materials in Nuclear Energy Systems (MinES) Conference 2023, New Orleans, LA.

- 2. E. Lang, S. Tyler, S. Cunningham, D. Sprouster, J. Trelewicz, I. McCue, K. Hattar. “In-situ Evaluation of Helium Bubble Migration and Coalescence in Tungsten Heavy Alloys” Microscopy and Microanalysis 29 (Supplement_1), 1541-1542 2023.
- 3. R. Schoell, E. Lang, B. Wolf, T.M. Moore, K. Jungjohann, K. Hattar. “The Physical and Engineering Limits of Coupled In situ TEM Experiments” Microscopy and Microanalysis 29 (Supplement_1), 1468-1469 2023.
- 4. E. Lang, N. Madden, D. Ellis, B. Matthews, P. Price, N. Li, P. Kotula, R. Tandon, A. Devaraj, K. Hattar. “Probing Neutron Irradiation Simulated Damage with Ion Irradiation and In-situ Mechanical Testing” TMS 2023 Conference, San Diego, CA.
- 5. X. Wang, A. Saefan, E. Lang, J.P. Allain. “Effects of Carbide Dispersoids on Helium Bubble Formation in Dispersion-strengthened Tungsten” TMS 2023 Conference, San Diego, CA.
- 6. O. Hussein, K. Coffman, K. Hattar, E. Lang, S. Dillon, F. Abdeljawad. “The Role of Grain Boundaries in the Morphological Instabilities of Nanoscale Geometries” TMS 2023 Conference, San Diego, CA.
- 7. K. Hattar, E. Lang. “Exploring the Thermal, Mechanical, and Radiation Stability of Refractory High Entropy Alloys via In-situ Electron Microscopy” TMS 2023 Conference, San Diego, CA.
- 8. D. Yadav, R. Schoell, E. Lang, B. Derby, J.K. Baldwin, N. Li, K. Hattar, J. Demkowicz, K. Xie. “Discovering the Mechanisms of Helium Channel Evolution Via In-situ Annealing and Observation in TEM” TMS 2023 Conference, San Diego, CA.
- 9. E. Lang, K. Small, R. Schoell, N. Madden, N. Li, B. Derby, K. Hattar. “In-situ Electron Microscopy Degradation in Extreme Environments” TMS 2023 Conference, San Diego, CA.
- 10. F. Abdeljawad, O. Hussein, K. Coffman, E. Lang, K. Hattar, S. Dillon. “Understanding Interfacial Kinetic Processes during Sintering to Enable Heterostructuring” TMS 2023 Conference, San Diego, CA.
- 11. M. Thomas, E. Lang, T. Clark, H. Salvador, K. Hattar, S. Mathaudhu. “Review of Irradiation-induced Grain Growth in Nanocrystalline FCC Metals” TMS 2023 Conference, San Diego, CA.
- 12. E. Lang. “Current and future advances in plasma-facing materials and experimental facilities to enable nuclear fusion.” CAARI 2022 Conference, Denton, TX.
- 13. E. Lang. “Current and future advances in plasma-facing materials and experimental facilities to enable nuclear fusion.” Rio Grande Symposium on Advanced Materials, 2022, Albuquerque, NM.
- 14. E. Lang, S.A. Briggs, T. Clark, N. Heckman, A. Monterrosa, C.M. Barr, B.L. Boyce, D. Buller, K. Hattar. “Coupling Extreme Environments in the SEM: Present and Future Developments.” MS&T 2022 Conference, Pittsburgh, PA.
- 15. S.J. Dillon, E. Lang, K. Hattar. “Ultrahigh Temperature In Situ TEM Based Small-scale Mechanical Characterization.” Microscopy and Microanalysis 28 (S1) 112-113, 2022.
- 16. E. Lang, S.A. Briggs, T. Clark, N. Heckman, A. Monterrosa, C.M. Barr, B.L. Boyce, D. Buller, K. Hattar. “Coupling Extreme Environments in the SEM: Present and Future Developments.” Microscopy and Microanalysis 28 (S1) 2086-2087, 2022.
- 17. E. Lang, N. Madden, R. Schoell, T. Clark, D.P. Adams, K. Hattar. “Structure and Phase Stability in Extreme Environments Explored via In-situ TEM Experiments.” Microscopy and Microanalysis 28 (S1) 1848-1850, 2022.
- 18. B.E. Matthews, K. Yano, S. Akers, M. Sassi, S. Taylor, L. Wang, R. Paudel, R. Comes, Y. Du, E. Lang, K. Hattar, S.R. Spurgeon. “Quantifying Defect Pathways for Disorder in La1-

xSr_xFeO₃/SrTiO₃ Thin Films.” Microscopy and Microanalysis 28 (S1) 2108-2109, 2022.

- 19. E. Lang, S.A. Briggs, T. Clark, N. Heckman, A. Monterrosa, C.M. Barr, B.L. Boyce, D. Buller, K. Hattar. “Advancing extreme environment understanding at the micro-Scale via in-situ SEM.” The Sixth International Workshop On TEM With In Situ Irradiation (WOTWISI-6), Ann Arbor, MI 2022.
- 20. E. Lang, N. Madden, C. Taylor, P. Price, K. Hattar, and R. Tandon. “Utilizing In Situ TEM to Decipher the Nanomechanical Properties of Helium Implanted Metals.” MRS Spring Meeting, Honolulu, HI 2022.
- 21. E. Lang, W.S. Cunningham, J. Trelewicz, K. Hattar, I. McCue. “In-situ TEM of the Microstructure and He Behavior of AM W Alloys.” TMS Annual Meeting and Exhibition, Anaheim, CA 2022.
- 22. E. Lang, K. Hattar, T. Richter, A. Nadzeyka, K. Hooghan. “Deciphering Liquid Metal Embrittlement and Altered FIB Damage Microstructures on Aluminum.” Microscopy and Microanalysis 27 (S1), 26-27, 2021.
- 23. E. Lang, M. Marshall, H. Padilla, B. Boyce, K. Hattar. “In-situ TEM Cryoindentation of Nanocrystalline Copper.” Microscopy and Microanalysis 27 (S1), 1492-1493, 2021.
- 24. E. Lang, C. Taylor, S. Pratt, T. Nenoff, K. Hattar. “Automated Crystal Orientation Mapping with a Liquid-Cell TEM.” Microscopy and Microanalysis 27 (S1), 2232-2233, 2021.
- 25. K. Hattar, E. Lang, W.S. Cunningham, S. Mathaudhu, J. Trelewicz. “In-situ Irradiation, Helium Implantation and Heating to Elucidate Mechanisms in Tungsten Alloys.” Microscopy and Microanalysis 27 (S1), 2636-2638, 2021.
- 26. E. Lang, N. Madden, C. Smith, J. Krogstad, J.P. Allain. “Unravelling the Effects of Second Phase Particles on the Morphology, Retention, and Mechanical Properties of W Alloys Under High Flux D/He Irradiation.” The 19th International Conference on Fusion Reactor Materials, La Jolla, CA, USA, October 27 – November 1 2019.

• **Conference Posters:**

- 1. A. Saefan, X. Wang, E. Lang, J.P. Allain. “Effects of Helium Implantation on Mechanical Properties Near the Tungsten-carbide Interfaces of Dispersion Strengthened Tungsten Alloy” TMS 2023 Conference, San Diego, CA.
- 2. H. Schamis, E. Lang, G. Sinclair, A. McLean, R. Wilcox, C. Hargrove, C.L. Perez, M. Parsons, J.P. Allain. “Surface morphology changes observed in dispersion-strengthened tungsten alloys exposed to L- and H-mode plasmas in the DIII-D tokamak.” Bulletin of the American Physical Society, 2022.
- 3. M. Venuti, T.M. Lu, K. Hattar, E. Lang, S. Eley. Effects of Disorder of the Skyrmion Phase in FeGe Thin Films, Bulletin of the American Physical Society, 2022.
- 4. E. Lambert, C. Hargrove, E. Lang, A.H.A. Saefan, X. Wang, J.P. Allain. “Investigating bubble formation in dispersion-strengthened tungsten alloys using in-situ TEM irradiation.” 63rd Annual Meeting of the APS Division of Plasma Physics, Pittsburgh, PA, USA, November 8-November 12, 2021.
- 5. E. Lang, C.N. Taylor, N. Madden, C. Smith, J. Krogstad, J.P. Allain. “Deciphering Multiscale Effects of Helium on Tungsten Alloys: Sputtering, Erosion, and Retention Properties under Low Energy Irradiation.” 24th International Conference on Plasma-Surface Interactions in Controlled Fusion Devices, Jeju, Korea, January 25 – 29, 2021.
- 6. N. Madden, E. Lang, S. Murray, J.P. Allain, D. Shoemaker, K. Hattar, J. Krogstad. “Defect Ordering in Yttria Stabilized Zirconia under 45 MeV Ion Irradiation.” TMS 2020, 149th Annual Meeting and Exhibition, San Diego, CA, USA, February 23-27 2020.
- 7. E. Lang, Q. Rizzardi, R. Maass, J.P. Allain. “Elucidating the Role of Dispersoids on the Bulk

and Nanomechanical Properties of Dispersion-strengthened W Alloys Following Ion Irradiation with In-situ Characterization.” TMS 2020, 149th Annual Meeting and Exhibition, San Diego, CA, USA, February 23-27 2020.

- 8. E. Lang, L. Garrison, N. Reid, X. Hu, J.P. Allain. “Surface Chemistry and Morphology Response of High-Temperature Ceramics to Low Energy, High Temperature D/He Irradiation.” The 19th International Conference on Fusion Reactor Materials, La Jolla, CA, USA, October 27 – November 1 2019.
- 9. L. Garrison, Y. Katoh, W. Geringer, M. Akiyoshi, T. Miyazawa, X. Chen, J. Echols, T. Graening, A. Hasegawa, T. Hinoki, X. Hu, T. Koyanagi, E. Lang, C. Parish, N. Reid, H. Wang. “Mechanical and Thermal Property Changes in Irradiated Tungsten.” The 19th International Conference on Fusion Reactor Materials, La Jolla, CA, USA, October 27 – November 1 2019.
- 10. E. Lang, L. Garrison, N. Reid, X. Hu, J.P. Allain. “Effect of Re Alloying on Surface Chemistry and Morphology Response of WRe Alloys to Low Energy, High Temperature D/He Irradiation.” The 17th International Conference on Plasma Facing Materials and Components for Fusion Applications, Eindhoven, the Netherlands, May 20-24, 2019.
- 11. N. Reid, M. Adbelghany, E. Lang, J.P. Allain. “Co-deposition of Graphite on Tungsten using Helium Ion Beams.” The 17th International Conference on Plasma Facing Materials and Components for Fusion Applications, Eindhoven, the Netherlands, May 20-24, 2019.
- 12. E. Lang, N. Reid, L. Garrison, C. Parish, J.P. Allain. “Pre-irradiation comparison of W-based alloys for the PHENIX campaign: microstructure, composition, and mechanical properties.” Technology of Fusion Energy 2018, American Nuclear Society Winter Meeting 2018, Orlando, FL, USA, November 11-15, 2018.
- 13. E. Lang, J. Gigax, N. Madden, C. Smith, J. Krogstad, L. Shao, J.P. Allain. “Elucidating the Role of Alloy Phase Structure and Pre-Irradiation on Tungsten Surface Behavior Under He/D Irradiation.” 21st International Conference on Ion Beam Modification of Materials, San Antonio, TX, USA, June 24-29, 2018.
- 14. E. Lang, N. Madden, C. Smith, Krogstad, J.P. Allain. “Tungsten Alloys: Mechanical Properties and Response to Low Energy, High Flux D and He Plasmas.” 23rd International Conference on Plasma-Surface Interactions in Controlled Fusion Devices, Princeton, NJ, USA, June 17-22, 2018.
- 15. E. Lang, N. Madden, C. Smith, J. Krogstad, J.P. Allain. “Development and characterization of dispersion strengthened tungsten alloys via spark plasma sintering.” 19th International Conference on Fusion Reactor Materials, Aomori, Japan, November 5-10, 2017.
- 16. E. Lang, N. Madden, C. Smith, J. Krogstad, J.P. Allain. “Development and characterization of dispersion strengthened tungsten alloys via spark plasma sintering.” 59th Annual Meeting of the APS Division of Plasma Physics, Milwaukee, WI, USA, October 23-27, 2017.
- 17. A. Kapat, E. Lang, A. Neff, J.P. Allain. “Li-based chemical dynamics on porous W during D₂ irradiation under simulated fusion PMI conditions.” 5th International Symposium on Liquid Metals Applications for Fusion. Moscow, Russia, September 25-27, 2017.
- 18. A. Kapat, E. Lang, J.P. Allain. “D Retention and wetting studies on tungsten-liquid metal hybrid systems” 16th International Conference on Plasma-Facing Materials and Components for Fusion Applications, Dusseldorf, Germany, May 16-19, 2017.
- 19. E. Lang, A. Kapat, J.P. Allain. “Behavior of a SnLi liquid metal eutectic on D-irradiated, porous tungsten substrates.” 58th Annual Meeting of the APS Division of Plasma Physics, San Jose, CA, USA, October 31-November 4, 2016.
- 20. A. Neff, E. Lang, J.P. Allain. “Erosion behavior of lithium coated tungsten fuzz samples under D and He ion irradiation.” 58th Annual Meeting of the APS Division of Plasma Physics, San Jose, CA, USA, October 31-November 4, 2016.

- 21. E. Lang, A. Kapat, J.P. Allain. “Determining liquid metal behavior and deuterium retention in tin-lithium-coated fuzzy tungsten substrates.” Fusion Materials Workshop, Knoxville TN, USA, July 27, 2016.
 - 22. E. Lang, A. Kapat, J.P. Allain. “Deciphering deuterium retention in D-irradiated porous low-Z coated tungsten nanostructures.” 22nd International Conference on Plasma Surface Interactions in Controlled Fusion Devices, Rome, Italy, May 30-June 3, 2016.
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Professional Service:

- **American Nuclear Society:** Member
 - Member – Accelerator Applications Division (AAD)
 - Member – Fusion Energy Division (FED)
 - Member – Materials Science & Technology Division (MSTD)
 - **American Physical Society:** Member
 - **American Chemical Society:** Member
 - **The Materials Society:** Member
 - Member – Nuclear Materials Committee
 - Member – NanoMechanical Behavior Committee
 - **CAARI-SNEAP Conference 2022:**
 - Session Organizer for “Radiation Effects in Non-Metallic Materials” Symposium
 - Session Chair for “Radiation Effects in Non-Metallic Materials” Symposium
 - Session Chair for “Radiation Effects in Semiconductors and Complex Oxides”
 - **Rio Grande Symposium on Advanced Materials**
 - Session Chair for “Electronics, Magnetics and Photonic Materials & Devices” Symposium
 - Session Chair for “Energy Nuclear Materials” Symposium
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Teaching Experience:

- University of New Mexico
 - NE 231 – Principles of Nuclear Engineering – Spring 2023 Semester
 - Instructor Spring 2023 Semester
 - Re-made course content to adapt for Spring 2023 Semester
 - NE 485/515 – Fusion Technology
 - Instructor for Fall 2023 Semester
 - Re-made course to adapt content for combined graduate/undergraduate course
 - NE 498L – Nuclear Engineering Design
 - Assisted Senior Design group with design project
 - NE 571 – Radiation Damage in Materials
 - Instructor for Fall 2023 Semester
 - NE 230 – Fundamentals of Nuclear Engineering
 - Guest lecture 4 times Fall 2022 Semester
 - NE 501 – Nuclear Engineering Seminar
 - University of Illinois - NPRES 429: Principles of Plasma-Material Interactions
 - Developed and delivered lectures on plasma surface kinetics
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Awards:

- **Mavis Future Faculty Fellow:** University of Illinois – Urbana Champaign, August 2019-May 2020
- **Student Paper Competition Winner:** Technology in Fusion Engineering (TOFE) Conference, Topical Meeting of the ANS Winter Meeting, Orlando, FL, Fall 2018
- **Bronze Tablet Recipient:** University of Illinois – Urbana Champaign, May 2016
 - Awarded to top 3% of graduates each academic year

Skills:

Research: SEM, EBSD, TEM, EDS, SAED, STEM, FIB, XRD, XPS, High vacuum systems and components, Surface spectroscopy, Low energy ion irradiation, Radiation Worker II Certified

Programming: ImageJ, Matlab, R, Python

Other: OriginPro, Microsoft Office Package

Other Publications:

1. A. Nathan, J. Kensrud, L. Smith, E. Lang. “Testing Trackman: Just how well does TrackMan work?” *Baseball Prospectus*. April 2014.
 2. E. Lang. “A physics comparison of great throws from year’s past.” *The Hardball Times*. June 2014.
 3. E. Lang. “A physics comparison of great throws from year’s past –pt. II.” *The Hardball Times*. July 2014.
 4. A. Nathan, J. Kensrud, L. Smith, E. Lang. “How far did that ball travel (redux)?” *Baseball Prospectus*. Dec. 2014.
 5. E. Lang. “Analyzing the strike zone as a three-dimensional volume.” *The Hardball Times*. Sept. 2015.
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Relevant Coursework:

- NPRE 498: Principles of Plasma-Material Interactions
 - NPRE 421: Plasma and Fusion Science
 - NPRE 429: Plasma Engineering
 - NPRE 423: Plasma Laboratory
 - MSE 405: Microstructure Characterization
 - NPRE 531: Advanced Nuclear Materials
 - MSE 481: Electron Microscopy
 - MSE 582: Surface Physics
 - EOL 585: College Teaching
 - ECE 518: Semiconductor Nanotechnology
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Community Involvement

- **Dukes Track Club Youth Team**
 - Assistant coach for Albuquerque area youth (ages 7-13) track team - 2023
 - Thrice weekly practices from March – June (track) and August – November (cross-country)

- **Albuquerque Concert Band**
 - Trombone player in community band - 2023
- **Citizens Climate Lobby**
 - Co-group coordinator for state of New Mexico - 2020-2022
 - Co-liaison for New Mexico Sen. Mark Heinrich
 - Lobby congressmembers and work with community to advocate for climate action, primarily in support of bipartisan Energy Innovation and Carbon Dividend Act
- **Indivisible Nob Hill**
 - Member of Climate Action Team tracking climate/environment bills in the New Mexico state legislature – 2020-2021
 - Advocating members of state legislature to support legislation
- **Worldwide Opportunities on Organic Farms (WWOOF)**
 - Volunteered at Earthkeeper Farm in Grand Rapids, MI (30 hours/week): August 2020
- **Daily Bread Soup Kitchen:** Volunteer, Champaign, IL
 - Serve meals to needy community members (3-5 hours/week): December 2018 – January 2020
- **Illini Ridgebacks Quidditch Team**
 - Member (6 hours/week): December 2018-May 2020

Other Work Experience:

Meat Science Laboratory, University of Illinois, Fall 2014 – Winter 2014

- Employee of campus butcher shop.

Campus Food Service, University of Illinois, Fall 2013-Winter 2013

- Employee of campus dining halls.

Student Tour Guide, University of Illinois, Summer 2013

LastWordonSports.com, August 2014 – November 2014

- Contributed weekly articles to website providing in-depth analysis of various baseball topics.

Vernon Hills Athletic Association, Vernon Hills, IL

Professional References:

1. Dr. Khalid Hattar, (505) 220-9667, khattar@sandia.gov, Post-doc Advisor
2. Prof. Jean Paul Allain, (814) 863-8575, allain@psu.edu, PhD Advisor
3. Prof. Jessica Krogstad, (217) 244-2118, jakrogst@illinois.edu, Faculty Mentor
4. Prof. David Ruzic, (217) 333-0332, druzic@illinois.edu, Faculty Mentor