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Experience

Jan 2017- Present Oak Ridge National Lab Oak Ridge, TN
Neutron Instrument Scientist

- Lead Instrument Scientist and Point of Contact for the residual stress diffractometer at HFIR (HIDRA)
- Lead the successful proposal and funding of CrESL LDRD (\$1.2 M)
- Mentored summer students and GO! Students
- Served on Committees for Ph.D. thesis.
- Working with INL as part of LDRD exploring Spark Plasma Sintering
- Lead the NRSF2 instrument upgrade project (~\$1million), to create the new world-class HIDRA instrument.
- Leading researcher in measurement of residual stresses in complex sonification processes such as welding and well as additive manufacturing.

Aug 2014 - Dec 2016 Oak Ridge National Lab Oak Ridge, TN
Postdoctoral Research Associate

- Engineering materials group, Neutron sciences directorate
- Extensively supported user activity at engineering diffractometer at HFIR (NRSF2) – Mapping of residual stresses in engineering components
- Conducted independent scientific research in engineering materials
 - ❖ Engineering Diffraction
 - ❖ Neutron Imaging / X-ray Imaging
 - ❖ Small Angle Neutron Scattering

Fall 2007 – Spring 2014 University of Tennessee Knoxville, TN
Graduate Research Assistant

- Experience in neutron and x-ray imaging and scattering techniques
- Research is centered around neutron scattering techniques as used in studying of complex loading *in situ*
- Highly experienced in the acquisition and analysis of both neutron and x-ray imaging for use in characterization of Hydrogen Fuel Cells (NSF Fellowship)

Education

2003-2007 University of Tennessee at Martin Martin, TN
B.S. in Engineering, Cum Laude

2007-2014 University of Tennessee Knoxville, TN
Ph.D. in Civil Engineering

Honors

- Invited talk at PRCIM9 meeting in Kyoto, Japan to discuss residual stress measurement using neutrons as part of the Materials Characterization and Evaluation session.
- Appointed to ASM International Emerging Professionals Committee
- Sub Committee Chair for the Education Subcommittee for the Residual Stress Technical Committee for ASM international
- A.F. Davis Silver Medal for the most outstanding paper in the Welding Journal (2017)
- A.F. Davis Silver Medal for the most outstanding paper in the Welding Journal (2019)
- A.F. Davis Silver Medal for the most outstanding paper in the Welding Journal (2021)
- Winner of R&D 100 award (2023) - **Additively Manufactured Thermally Conductive Collimators for Neutron Instrumentation**, developed by ORNL and PolarOnyx.

Special Skills

- Published peer-reviewed articles in the areas of non-destructive characterization of engineering materials using x-rays and neutrons
- Over 10 years of experience working in a laboratory setting performing non-destructive evaluation
- Expert in use of neutron and x-ray diffraction for the purpose of residual stress measurements
- Expert in use of neutron and x-ray imaging (both polychromatic and energy selective) for characterization
- Worked extensively with industrial users to obtain useful data for use in design
- Demonstrated ability to effectively communicate scientific output, even to non-scientific audiences
- Demonstrated ability to work interdependently within a scientific group with various interests and specialties
- Programming and data reduction expertise with Excel, MATLAB and python
- Specific techniques of which I am proficient: XRD, SAXS, CT-Imaging (neutron and x-ray), SANS, Radiography (neutron and x-ray)

Publications List

1. Roper, C. M., Fancher, C. M., **Bunn, J. R.**, & Brewer, L. N. (2024). Residual Stress in Cold Spray SS304L Measured Via Neutron Diffraction and Comparison of Analytical Models to Predict the Residual Stress. *Journal of Materials Engineering and Performance*. doi:10.1007/s11665-024-09422-6
2. Wing, B. J., Polsky, D., **Bunn, J. R.**, Payzant, E. A., & Rawn, C. J. (2024). Neutron Diffraction Residual Stress Study of a AA2219-T87 Self-Reacting Friction Stir Weld. *Journal of Materials Engineering and Performance*. doi:10.1007/s11665-024-09278-w
3. Minneci, R. P., Haines, M. P., Gradl, P. R., Ellis, D. L., Lass, E. A., **Bunn, J. R.**, . . . Rawn, C. J. (2024). Characterization and Rationalization of Microstructural Evolution in GRCop-84 Processed by Laser-Powder Bed Fusion (L-PBF). *Metallurgical and Materials Transactions A*, 55(5), 1377-1396. doi:10.1007/s11661-024-07315-w
4. Zhang, X., Kornmeier, J. R., Hofmann, M., Langebeck, A., Alameddin, S., Alessio, R. P., . . . **Bunn, J.R.**, Cabeza, S. (2023). Residual stresses in Cu matrix composite surface deposits after laser melt injection. *Strain*. doi:10.1111/str.12457
5. **Bunn, J. R.**, Fancher, C. M., Payzant, E. A., Cornwell, P. A., Bailey, W. B., & Gregory, R. (2023). The high intensity diffractometer for residual stress analysis (HIDRA), a third generation residual stress mapping neutron diffractometer at the high flux isotope reactor. *Review of Scientific Instruments*, 94(3), 035101. doi:10.1063/5.0122250
6. Yang, Y., Han, D., Gao, Y., Zhang, W., **Bunn, J. R.**, Payzant, E. A., . . . Feng, Z. (2022). Residual Stress Modeling and Advanced Diffraction Measurements of 347H Steel Weldments. Paper presented at the ASME 2022 Pressure Vessels & Piping Conference.
7. Abusalma, H., Eisazadeh, H., Hejripour, F., **Bunn, J.**, & Aidun, D. K. (2022). Parametric study of residual stress formation in Wire and Arc Additive Manufacturing. *Journal of Manufacturing Processes*, 75, 863-876. doi:https://doi.org/10.1016/j.jmapro.2022.01.043
8. Fancher, C. M., **Bunn, J. R.**, Bilheux, J., Zhou, W., Whitfield, R. E., Borreguero, J., & Peterson, P. F. (2021). pyRS: a user-friendly package for the reduction and analysis of neutron diffraction data measured at the High Intensity Diffractometer for Residual Stress Analysis. *Journal of Applied Crystallography*, 54(6), 1886-1893. doi:doi:10.1107/S1600576721010554
9. Watkins, T. R., Unocic, K. A., Peralta, A., Megahed, M., **Bunn, J. R.**, Fancher, C. M., . . . Neumann, J. F. (2021). Residual stresses and microstructure within Allvac 718Plus laser powder bed fusion bars. *Additive Manufacturing*, 47, 102334. doi:https://doi.org/10.1016/j.addma.2021.102334
10. Peterson, N. E., Einhorn, J. R., Fancher, C. M., **Bunn, J. R.**, Payzant, E. A., & Agnew, S. R. (2021). Quantitative texture analysis using the NOMAD time-of-flight neutron diffractometer. *Journal of Applied Crystallography*, 54(3), 867-877. doi:doi:10.1107/S1600576721003022
11. Ryan, S., Gallardy, D., Zellner, M., **Bunn, J.**, Nguyen, L., & Swoboda, P. (2021). Investigating the relationship between radial pre-stress magnitude and ballistic projectile dwell in heavy confined ceramic targets. *International Journal of Impact Engineering*, 157, 104002. doi:https://doi.org/10.1016/j.ijimpeng.2021.104002
12. Peterson, N. E., Einhorn, J. R., Fancher, C. M., **Bunn, J. R.**, Payzant, E. A., & Agnew, S. R. (2021). Quantitative texture analysis using the NOMAD time-of-flight neutron diffractometer. *Journal of Applied Crystallography*, 54(3), 867-877.

13. Nycz, A., Lee, Y., Noakes, M., Ankit, D., Masuo, C., Simunovic, S., **Bunn J.** . . . Fancher, C. (2021). Effective Residual Stress Prediction Validated with Neutron Diffraction Method for Metal Large-Scale Additive Manufacturing. *Materials & Design*, 109751. doi:<https://doi.org/10.1016/j.matdes.2021.109751>
14. Sridharan, N., **Bunn, J.**, Kottman, M., Fancher, C. M., Payzant, A., Noakes, M., . . . Babu, S. (2021). Consumable development to tailor residual stress in parts fabricated using directed energy deposition processes. *Additive Manufacturing*, 39, 101837.
15. Nicholson, D. E., Padula, S. A., Benafan, O., **Bunn, J. R.**, Payzant, E. A., An, K., . . . Vaidyanathan, R. (2021). Mapping of Texture and Phase Fractions in Heterogeneous Stress States during Multiaxial Loading of Biomedical Superelastic NiTi. *Advanced Materials*, 33(5), 2005092.
16. Chatzidakis, S., Tang, W., Miller, R., Payzant, A., **Bunn, J.**, Bryan, C., . . . Wang, J.-A. (2021). Neutron diffraction illustrates residual stress behavior of welded alloys used as radioactive confinement boundary. *International Journal of Pressure Vessels and Piping*, 191, 104348.
17. Wu, X., Wang, Z., Yu, Z., Liu, S., **Bunn, J. R.**, Kolbus, L., & Feng, Z. (2020). Control of Weld Residual Stress in a Thin Steel Plate through Low Transformation Temperature Welding Consumables. *Welding Journal*, 99(4).
18. Pajerowski, D. M., Ng, R., Peterson, N., Zhang, Y., Stone, M. B., Dos Santos, A. M., . . . Fanelli, V. (2020). 3D scanning and 3D printing AlSi10Mg single crystal mounts for neutron scattering. *Review of Scientific Instruments*, 91(5), 053902.
19. Noyan, I. C., **Bunn, J. R.**, Tippett, M., Payzant, E., Clausen, B., & Brown, D. W. (2020). Experimental determination of precision, resolution, accuracy and trueness of time-of-flight neutron diffraction strain measurements. *Journal of Applied Crystallography*, 53(2), 494-511.
20. Minneci, R. P., Lass, E. A., **Bunn, J. R.**, Choo, H., & Rawn, C. J. (2020). Copper-based alloys for structural high-heat-flux applications: a review of development, properties, and performance of Cu-rich Cu–Cr–Nb alloys. *International Materials Reviews*, 1-32.
21. Liu, T., Vaudin, M. D., **Bunn, J. R.**, Ungár, T., & Brewer, L. N. (2020). Quantifying dislocation density in Al-Cu coatings produced by cold spray deposition. *Acta Materialia*, 193, 115-124.
22. Liu, T., **Bunn, J. R.**, Fancher, C. M., Nastac, L., Arvikar, V., Levin, I., & Brewer, L. N. (2020). Neutron Diffraction Analysis of Residual Strain in High-Pressure Die Cast A383 Engine Blocks. *Journal of Materials Engineering and Performance*, 29(8), 5428-5434.
23. Bedekar, V., Voothaluru, R., **Bunn, J.**, & Hyde, R. S. (2019). Measurement and prediction of through-section residual stresses in the manufacturing sequence of bearing components. *CIRP Annals*. <https://doi.org/10.1016/j.cirp.2019.03.004>
24. Chatzidakis, S., Tang, W., Chen, J., Miller, R. G., Payzant, A., **Bunn, J. R.**, & Wang, J.-A. J. (2019). *Neutron Residual Stress Mapping of Repaired Spent Nuclear Fuel Welded Stainless-Steel Canisters*. Paper presented at the Conference: IHLRWM 2019 - Knoxville, Tennessee, United States of America.
25. Fancher, C. M., Hoffmann, C. M., Frontzek, M. D., **Bunn, J. R.**, & Payzant, E. A. (2019). Probing orientation information using 3-dimensional reciprocal space volume analysis. *Review of Scientific Instruments*, 90(1), 013902. doi:10.1063/1.5034135
26. Cornwell, P., **Bunn, J.**, Fancher, C. M., Payzant, E. A., & Hubbard, C. R. (2018). Current capabilities of the residual stress diffractometer at the high flux isotope reactor. *Review of Scientific Instruments*, 89(9), 092804. doi:10.1063/1.5037593
27. Eisazadeh, H., Payzant, E. A., Cornwell, P. A., **Bunn, J. R.**, & Aidun, D. K. (2018). Exploring the Cooling Process for Residual Stress Reduction in Dissimilar Welds. *Welding Journal*, 97(11), 315S-325S. doi:10.29391/2018.97.027
28. Ikeda, T., **Bunn, J.**, Fancher, C., Seid, A., Motani, R., Matsuda, H., & Okayama, T. (2018). Non-Destructive Measurement of Residual Strain in Connecting Rods Using Neutrons. <https://doi.org/10.4271/2018-01-1063>

29. Kemerling, B., Lippold, J. C., Fancher, C. M., & **Bunn, J.** (2018). Residual stress evaluation of components produced via direct metal laser sintering. *Welding in the World*, 62(3), 663-674. doi:10.1007/s40194-018-0572-z
30. Moraes, J. F. C., Jordon, J. B., Su, X., Brewer, L. N., Fay, B. J., **Bunn, J. R.**, . . . Barkey, M. E. (2018). Residual Stresses and Plastic Deformation in Self-Pierce Riveting of Dissimilar Aluminum-to-Magnesium Alloys: SAE International.
31. Wang, J.-A. J., Payzant, A., **Bunn, J. R.**, & An, K. (2018). Neutron Residual Stress Mapping for Spent Nuclear Fuel Storage Canister Weldment (ORNL/TM-2018/827 United States 10.2172/1435212 ORNL English). Retrieved from <https://www.osti.gov/servlets/purl/1435212>
32. Xinghua, Y., Demetrios, T., **Jeff, B.**, Andrew, P. E., & Zhili, F. (2017). Tensile Residual Stress Mitigation Using Low Temperature Phase Transformation Filler Wire in Welded Armor Plates Residual Stresses 2016: ICRS-10 (Vol. 2, pp. 461-466).
33. Steiner, M. A., **Bunn, J. R.**, Einhorn, J. R., Garlea, E., Payzant, E. A., & Agnew, S. R. (2017). Path length dependent neutron diffraction peak shifts observed during residual strain measurements in U-8 wt% Mo castings. *Journal of Applied Crystallography*, 50, 851-858. doi:10.1107/S1600576717005295
34. Pupilampu, S. B., Penumadu, D., Ma, R., Truster, T. J., Woracek, R., Payzant, E. A., & **Bunn, J. R.** (2017). Degradation and onset of plastic anisotropy in marine aluminum alloy due to fire exposure by bulk neutron diffraction and in situ loading. *Materials Science and Engineering a-Structural Materials Properties Microstructure and Processing*, 700, 583-591. doi:10.1016/j.msea.2017.06.050
35. Hempel, N., **Bunn, J.R.**, et al. (2017). "Study on the residual stress relaxation in girth-welded steel pipes under bending load using diffraction methods." *Materials Science and Engineering: A* **688**: 289-300.
36. N. Hempel, **J.R. Bunn**, T. Nitschke-Pagel, E.A. Payzant, K. Dilger, 'Residual Stress Analysis in Girth-welded Ferritic and Austenitic Steel Pipes Using Neutron and X-Ray Diffraction', *Materials Research Proceedings*, Vol. 2, pp 229-234, 2017
37. X. YU, D. TZELEPIS, **J. BUNN**, A.E. PAYZANT, Z. FENG, 'Tensile Residual Stress Mitigation Using Low Temperature Phase Transformation Filler Wire in Welded Armor Plates', *Materials Research Proceedings*, Vol. 2, pp 461-466, 2017
38. H. Eisazadeh, **J. Bunn**, and D. K. Aidun, "Numerical and Experimental Investigation of Residual Stress Distribution in a Dissimilar Ferritic-Austenitic Weld", *Welding Journal*, vol.96, no.1, p.21-s (January 2017)
39. Eisazadeh, H., **Bunn, J.R.**, et al. (2016). "A Residual Stress Study in Similar and Dissimilar Welds" *Welding Journal* 95(4).
40. Penumadu, D., Kim, F.S., **Bunn, J.R.** (2016). "Damage of Composite Materials Subjected to Projectile Penetration Using High Resolution X-Ray Micro Computed Tomography." *Experimental Mechanics* 56(4): 607-616.
41. Cakmak, E., Watkins, T.R., **Bunn, J.R.**, et al (2016). "Mechanical Characterization of an Additively Manufactured Inconel 718 Theta-Shaped Specimen." *Metallurgical and Materials Transactions a-Physical Metallurgy and Materials Science* 47A(2): 971-980.
42. S. D. Bagg, L. M. Sochalski-Kolbus, **J. R. Bunn**, (2016) "The Effect of Laser Scan Strategy on Distortion and Residual Stresses of Arches Made With Selective Laser Melting." in American Society of Precision Engineering (ASPE) 2016 Summer Topical Meeting: Dimensional Accuracy and Surface Finish in Additive Manufacturing; 27-30 Jun. 2016.
43. **Bunn, J. R.**, et al. (2014). "Effect of Multi-Axial Loading on Residual Strain Tensor for 12L14 Steel Alloy." *Metallurgical and Materials Transactions a-Physical Metallurgy and Materials Science* 45A(9): 3806-3813.
44. **Bunn, J. R.** (2014). Neutron Diffraction Study of Engineering Materials Subjected to Complex Loadings. *Civil and Environmental Engineering*, University of Tennessee. Doctor of Philosophy.

45. Woracek, R., **Bunn, J.R.**, et al. (2013). "Methodology for Combined Neutron Diffraction and Bragg Edge Imaging." MRS Proceedings 1528: mrsf12-1528-vv1508-1504.
46. **Bunn, J. R.**, et al. (2013). "Detection of water with high sensitivity to study polymer electrolyte fuel cell membranes using cold neutrons at high spatial resolution." Applied Physics Letters 102(23).
47. Woracek, R., **Bunn, J.R.**, et al. (2012). "New Approach to Measure Lattice Strains under Torsional Shear Using In Situ Neutron Diffraction for Polycrystalline Materials." AIP Conference Proceedings..
48. Woracek, R., **Bunn, J.R.**, et al. (2012). "Method to determine hkl strains and shear moduli under torsion using neutron diffraction." Applied Physics Letters 100(19).
49. Kim, F., et al. (2011). Three Dimensional Microstructure of Polymeric Composite Materials Used in Sandwich Structures Using Dual Modality From Combined High Resolution X-ray and Neutron Tomography. 18th International Conference on Composites Materials (ICCM).
50. **Bunn, J.**, et al. (2010). "Residual strain evolution in steel samples: tension versus torsion." Applied Physics A 99(3): 571-578.
51. LeMaster, R., et al. (2009). "In-Situ Measurement of Stresses in Carburized Gears via Neutron Diffraction." Gear Technology 26(3): 38-43.
52. Lemaster, R. A., et al. (2009). "Grinding Induced Changes in Residual Stresses of Carburized Gears." Gear Technology 26(2): 42-49.