Todd A. Palmer, Ph.D., M.B.A.

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# CURRENT RESEARCH INTERESTS

* High energy density (electron beam and laser) processing and joining of structural and advanced materials
* Development of process-structure-property relationships in additive manufacturing of metals
* Application of additive manufacturing to repair and part refurbishment
* Characterization of phase transformations using synchrotron based in situx-ray diffraction techniques
* Physical metallurgy of gears and bearings
* Plasma-metal interactions
* Electron beam diagnostics development
* Economics and business development in materials and manufacturing industries

# EDUCATION

Pennsylvania State University, University Park, PA, World Campus

Master of Business Administration (M.B.A.), August 2007

Pennsylvania State University, University Park, PA

Ph.D. in Materials Science and Engineering, December 1999.

Thesis Topic: “Nitrogen in Plasmas and Steel Weld Metal”

Advisor: Dr. T. DebRoy

Pennsylvania State University, University Park, PA

M.S. in Metals Science and Engineering, December 1995.

Thesis Topic: “Physical Modeling of the Nitrogen Partition between the Weld Metal and

its Plasma Environment”

Advisor: Dr. T. DebRoy

Pennsylvania State University, University Park, PA

B.S. in Metals Science and Engineering, May 1992.

United States Army Field Artillery Officer Basic Course, Fort Sill, OK

August 1992 to January 1993 (Commandant’s List Graduate).

**WORK EXPERIENCE**

Aug. 2017 – Present Professor, Departments of Engineering Science and Mechanics and Materials Science and Engineering, Pennsylvania State University, University Park, PA

July 2013 – Aug. 2017 Senior Research Associate and Senior Scientist, Applied Research Laboratory, Pennsylvania State University, University Park, PA

July 2013 – Aug. 2017 Associate Professor, Department of Materials Science and Engineering, Pennsylvania State University, University Park, PA

Sept. 2007 – June 2013 Research Associate, Applied Research Laboratory, Pennsylvania State University, University Park, PA

Sept. 2007 – June 2013 Assistant Professor, Department of Materials Science and Engineering, Pennsylvania State University, University Park, PA

May 2001 – Aug. 2007 Metallurgist, Lawrence Livermore National Laboratory, Livermore, CA

* Provided metallurgical and associated technical support to programmatic initiatives.
* Performed research activities on phase transformations in metals occurring during welding using a unique synchrotron x-ray diffraction technique.
* Provided support and direction to the development and application of electron beam diagnostics for both research and quality control in electron beam welding.

May 2000 –May 2001 Post-Doctoral Technical Staff Member, Lawrence Livermore National Laboratory, Livermore, CA

Performed research activities in welding-related processes for a number of sponsored programs.

Oct. 1999 – May 2000 Post-Doctoral Research Associate, Pennsylvania State University, University Park, PA

Performed research activities in welding-related processes on projects sponsored by the U.S. Department of Energy.

Jun. 1996 - Sep. 1999 Metallography Laboratory Supply Supervisor, Metals Science and Engineering Program, The

Pennsylvania State University, University Park, PA

Maintained optical microscopy and metallography facilities within the Program. Responsibilities include the purchase of supplies and equipment for sample preparation, care-taking of the optical microscopes, and guidance on the purchase of new equipment.

Aug. 1993 - Sep. 1999 Graduate Research Assistant, Pennsylvania State University, University Park, PA

Performed research activities, including experimental and theoretical work, in welding-related processes on projects sponsored by the U.S. Department of Energy.

**HONORS AND AWARDS**

2022 Fellow of ASM International

This award recognizes members of distinguished contributions in the field of materials science and engineering and develops a broadly based forum for technical and professional leaders to serve as advisors to the Society.

2018 Fellow of the American Welding Society

This award recognizes members for distinguished contributions to the field of welding science and technology, and for promoting and sustaining the professional stature of the field.

2017 McKay-Helm Award, American Welding Society

This award is presented to the authors of papers published in the Welding Journal during the previous calendar year for the best contribution to the advancement of knowledge relative to the welding of low alloy steels, stainless steels, or the application of surfacing weld metals.

2015 Adams Memorial Membership Award, American Welding Society

This award recognizes educators for outstanding teaching activities in their undergraduate and postgraduate engineering institutions.

2010 McKay-Helm Award, American Welding Society

This award is presented to the authors of papers published in the Welding Journal during the previous calendar year for the best contribution to the advancement of knowledge relative to the welding of low alloy steels, stainless steels, or the application of surfacing weld metals.

2008 A.F. Davis Silver Medal Award, American Welding Society

This award is presented to the authors of papers published in the *Welding Journal* during the previous calendar year that represent the best contribution to the progress of welding in the area of machine design.

2007 A.F. Davis Silver Medal Award, American Welding Society

This award is presented to the authors of papers published in the *Welding Journal* during the previous calendar year that represent the best contribution to the progress of welding in the area of maintenance and surfacing.

2006 Prof. Koichi Masubuchi Award, American Welding Society

This award is presented to an individual under the age of 40 years who has made significant contributions to the advancement of science and technology of materials joining through research and development.

2004 William Sparagen Memorial Award, American Welding Society.

This award is presented to the overall best research paper published in the *Welding Journal* in 2004.

2000 Geoffrey Belton Award, The Iron and Steel Society.

This award is presented to the best doctoral thesis in the fields of iron and steel submitted during 1999-2000.

1999 ASM International Graduate Student Paper Competition.

American Welding Society Graduate Research Fellowship (June 1995-June 1998).

**PROFESSIONAL ACTIVITIES**

Key Reader, *Metallurgical and Materials Transactions*

Principal Reviewer, *Welding Journal Research Supplement*.

Member, Editorial Board, *Science and Technology of Welding and Joining*

Chair, American Welding Society C7 Committee on High Energy Beam Welding and Cutting (2013-2018)

Chair, American Welding Society C7B Sub-Committee on Electron Beam Welding and Cutting (2006-2016)

Vice-Chair, American Welding Society D20 Committee on Additive Manufacturing (2013-2015)

Vice-Chair, American Welding Society Fellows Committee

Member, American Welding Society Welding Research and Development Committee

Member, Journal of Materials Engineering and Performance Editorial Committee, ASM International

Member, American Welding Society

Member, ASM International

Executive Committee, Penn State Chapter, ASM International, 2018-present.

Chairman, Penn State Chapter, ASM International, 2009-2011 Academic Years.

Vice Chairman, Penn State Chapter, ASM International, 1997-1998 Academic Year.

Organizing Committee, Golden Anniversary McFarland Award Symposium, ‘Metals Into The 21st Century’, The Pennsylvania State University, April 24, 1998.

# PATENTS

A.T. Teruya, J.W. Elmer, and *T.A. Palmer*, “Slit Disk for Modified Faraday Cup Diagnostic for Determining Power Density of Electron and Ion Beams**”,** U.S. Patent No. 7,902,503, 2011.

J.W. Elmer, A.T. Teruya, and *T.A. Palmer*, “Electron Beam Diagnostic for Profiling High Power Beams”, U.S Patent No. 7,348,568, 2008.

J.W. Elmer, A.T. Teruya, *T.A. Palmer*, and C.C. Walton, “Diagnostic System for Profiling Micro-Beams”, U.S Patent No. 7,288,722 B2, 2007.

J.W. Elmer, *T.A. Palmer*, and A.T. Teruya, “Trigger Probe for Determining the Orientation of the Power Distribution of an Electron Beam”, U.S Patent No. 7,244,950 B2, 2007.

# PUBLICATIONS (Web of Science: 109 publications; h index: 34; Citations: 5,076 as of September 25, 2023)

1. M. Z. Gao, B. Mondal, *T. A. Palmer*, W. Zhang, T. DebRoy, “Integration of Modeling Tools to Identify Cracking Mechanisms during Deep Penetration Laser Welding of Nickel Alloys”, *Science and Technology of Welding and Joining*, 2023, DOI: 10.1080/13621718.2023.2207950.
2. I.J. Wietecha-Reiman, A. Segall, X. Zhao, and *T.A. Palmer*, “Combining Fractal and Topological Analyses to Quantify Fracture Surfaces in Additively Manufactured Ti-6Al-4V”, *International Journal of Fatigue*, 166, 2023, 107232.
3. B. Mondal, T. Mukherjee, N.W. Finch, A. Saha, M.Z. Gao, *T.A. Palmer*, and T. DebRoy, “Vapor Pressure versus Temperature Relations of Common Elements”, *Materials*, 2023, 16, 50.
4. M.J.K. Lodhi, A.D. Iams, E. Sikora, and *T.A. Palmer*, “Microstructural Features Contributing to Macroscopic Corrosion: The Role of Oxide Inclusions on the Corrosion Properties of Additively Manufactured 316L Stainless Steel”, *Corrosion Science*, 203, 2022, 110354.
5. J.S. Zuback, A.D. Iams, F. Zhang, L.A. Giannuzzi, and *T.A. Palmer*, “Stable Nitride Precipitation in Additively Manufactured Nickel Superalloys”, *Journal of Alloys and Compounds*, 910, 2022, 164918
6. B. Mondal, M. Gao, *T. A. Palmer*, and T. DebRoy, “Solidification Cracking of a Nickel Alloy during High Power Keyhole Mode Laser Welding”, *Journal of Materials Processing Technology*, 305, 2022 117576
7. A. D. Iams, M. Z. Gao, A. Shetty, and *T. A. Palmer*, “Influence of Particle Size on Powder Rheology and Effects on Mass Flow During Directed Energy Deposition Additive Manufacturing”, *Powder Technology*, 396, 2022, 316-326.
8. M.C. Brennan, J.S. Keist, and *T.A. Palmer*, “Defects in Metal Additive Manufacturing Processes”, *Journal of Materials Engineering and Performance*, 30, 2021, 4808-4818.
9. S. Nayir, J.S. Keist, and *T.A. Palmer*, “Impact of changes in heat input on microstructure and mechanical properties of additively manufactured Ti-6Al-4V fabricated by Directed Energy Deposition”, *Materials Science and Engineering A*, 822, 2021, 141541.
10. A.D. Iams, J.S. Keist, L.A. Giannuzzi, and *T.A. Palmer*, “Role of Oxygen Composition on the Formation of Oxide Inclusions in an Additively Manufactured Super Duplex Stainless Steel”, *Metallurgical and Materials Transactions A*, 52, 2021, 3401-3412.
11. D.J. Shaffer, A.E. Wilson-Heid, J.S. Keist, A.M. Beese, *T.A. Palmer*, “Impact of Retained Austenite on the Aging Response of Additively Manufactured 17-4 PH Grade Stainless Steel”, *Materials Science and Engineering A*, 817, 2021, 141363.
12. M. Z. Gao, B. Ludwig, and *T.A. Palmer*, “Impact of atomization gas on characteristics of austenitic stainless steel powder feedstocks for additive manufacturing”, *Powder Technology*, 383, 2021, 30-42.
13. M.Z. Gao, G. Martiska, D. van der Wiel, and *T.A. Palmer, “R*ound Robin Testing of Austenitic Stainless Steel Powders using a Rotating Drum Rheology Tool”, *International Journal of Powder Metallurgy*, 56(4), 2020, 31-39.
14. J.S. Zuback, G.L. Knapp, *T.A. Palmer*, and T. DebRoy, “Deposit Geometry and Oxygen Concentration Spatial Variations due to Composition Change in Printed Functionally Graded Components”, *International Journal of Heat and Mass Transfer*, 164, 2021, 120526.
15. J.S. Keist, S. Nayir, and *T.A. Palmer*, “Impact of Hot Isostatic Pressing on the Mechanical and Microstructural Properties of Additively Manufactured Ti-6Al-4V Fabricated Using Directed Energy Deposition”, *Materials Science and Engineering A*, 787, 2020, 139454.
16. B.J. Simmonds, E.J. Garboczi, *T.A. Palmer*, and P.A. Williams, “Dynamic Laser Absorptance Measured in a Geometrically Characterized Stainless Steel Powder”, *Physical Review Applied*, 13, 2020, 024057.
17. *T.A. Palmer*, “Materials Challenges in the Additive Manufacturing of Metals”, *Welding Journal*, 99(2), 2020, 31-35.
18. A.D. Iams, J.S. Keist, and *T.A. Palmer*, “Microstructural Features in Additively Manufactured and Post-Processed Duplex Stainless Steel Alloys”, *Metallurgical and Materials Transactions A*, 51, 2020, 982-999.
19. J.L. Johnson and *T.A. Palmer*, “Directed Energy Deposition of Molybdenum”, *International Journal of Refractory Metals and Hard Materials*, 84, 2019, 105029.
20. J. Jovanova, M. Frecker, R.F. Hamilton, and *T.A. Palmer*, “Target Shape Optimization of Functionally Graded Shape Memory Alloy Compliant Mechanisms”, *Journal of Intelligent Material Systems and Structures*, 30(9), 2019, 1385-1396.
21. B.A. Bimber, R.F. Hamilton, and *T.A. Palmer*, “Ni-Concentration Dependence of Directed Energy Deposited NiTi Alloy Microstructures”, *Shape Memory and Superelasticity*, 5(2), 2019, 182-187.
22. D.W. Brown, D.P. Adams, L. Balogh, J.S. Carpenter, B. Clausen, V. Livescu, R. Martinez, B. Morrow, *T.A. Palmer*, R. Pokharel, M. Strantza, and S.C. Vogel, “Using In-situ Neutron Diffraction to Isolate Specific Features of Additively Manufactured Microstructures in 304L Stainless Steel and Identify Their Effect on Macroscopic Strength”, *Metallurgical and Materials Transactions A*, 50(7), 2019, 3399-3413.
23. J.S. Zuback, P. Moradifar, Z. Khayat, N. Alem, and *T.A. Palmer*, “Impact of Chemical Composition on Precipitate Morphology in an Additively Manufactured Nickel Base Superalloy”, *Journal of Alloys and Compounds*, 798, 2019, 446-457.
24. J.S. Zuback, *T.A. Palmer*, and T. DebRoy, “Additive Manufacturing of Functionally Graded Transition Joints between Ferritic and Austenitic Alloys”, *Journal of Alloys and Compounds*, 770, 2019, 995-1003.
25. S. Meredith, J.S. Zuback, J.S. Keist, and *T.A. Palmer*, “Impact of Composition on the Heat Treatment Response of Additively Manufactured 17-4 PH Grade Stainless Steel”, *Materials Science and Engineering A*, 738, 2018, 44-56.
26. D.R. Waryoba, J.S. Keist, C. Ranger, *T.A. Palmer*, “Microtexture in Additively Manufactured Ti-6Al-4V Fabricated Using Directed Energy Deposition”, *Materials Science and Engineering A*, 734, 2018, 149-163.
27. Z.R. Khayat and *T.A. Palmer*, “Impact of Iron Composition on the Properties of an Additively Manufactured Solid Solution Strengthened Nickel Base Alloy”, Materials Science and Engineering A, 718, 2018, 123-134.
28. R.F. Hamilton, B.A. Bimber, and *T.A. Palmer*, “Correlating Microstructure and Superelasticity of Directed Energy Deposition Additive Manufactured Ni-Rich NiTi Alloys”, Journal of Alloys and Compounds, 739, 2018, 712-722.
29. D.W. Brown, D.P. Adams, L. Balogh, J.S. Carpenter, B. Clausen, G. King, B. Reedlunn, T.A. Palmer, M.C. Maguire, and S.C. Vogel, “In Situ Neutron Diffraction Study of the Influence of Microstructure on the Mechanical Response of Additively Manufactured 304L Stainless Steel”, Metallurgical and Materials Transactions A, 48A, 2017, 6055-6069.
30. G. L. Knapp, T. Mukherjee, J. S. Zuback, H. L. Wei, *T. A. Palmer*, A. De, and T. DebRoy, “Building Blocks for a Digital Twin of Additive Manufacturing”, Acta Materialia, 135, 2017, 390-399.
31. B.K. Foster, A.M. Beese, J.S. Keist, E.T. McHale, and *T.A. Palmer*, “Impact of Interlayer Dwell Time on Microstructure and Mechanical Properties of Nickel and Titanium Alloys”, Metallurgical and Materials Transactions A, 48(9), 2017, 4411-4422.
32. J.S. Keist and *T.A. Palmer*, “Development of Strength-Hardness Relationships in Additively Manufactured Titanium Alloys”, *Materials Science and Engineering A*, 693, 2017, 214-224.
33. M.F. Gouge, *T.A. Palmer*, and P. Michaleris, “Fixturing Effects in the Thermal Modeling of Laser Cladding”, *Journal of Manufacturing Science and Engineering*, 139(1), 2017, DOI: 10.1115/1.4034136.
34. B.A. Bimber, R.F. Hamilton, J.S. Keist, and *T.A. Palmer*, “Anisotropic Microstructure and Superelasticity of Additive Manufactured NiTi Alloy Bulk Builds Using Laser Directed Energy Deposition”, *Materials Science and Engineering A*, 674, 2016, 125–134.
35. J.C. Heigel, P. Michaleris, and *T.A. Palmer*, “Measurement of Forced Surface Convection in Directed Energy Deposition Additive Manufacturing”, *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, 230(7), 2016, 1295-1308.
36. J.S. Keist and *T.A. Palmer*, “Role of Geometry on Properties of Additively Manufactured Ti-6Al-4V Structures Fabricated Using Laser Based Directed Energy Deposition”, *Materials and Design*, 106, 2016, 482-494.
37. Z. Wang, T.A. Palmer, and A.M. Beese, “Effect of Processing Parameters on Microstructure and Tensile Properties of Austenitic Stainless Steel 304L Made by Directed Energy Deposition Additive Manufacturing”, *Acta Materialia*, 110, 2016, 226-235.
38. J.C. Heigel, M.F. Gouge, P. Michaleris, and *T.A. Palmer*, “Selection of Powder or Wire Feedstock Material for the Laser Cladding of Inconel® 625”, *Journal of Materials Processing Technology*, 231, 2016, 357-365.
39. J.J. Blecher, *T.A. Palmer*, and T. DebRoy, “Porosity in Thick Section Alloy 690 Welds – Experiments, Modeling, Mechanism, and Remedy”, *Welding Journal (Research Supplement)*, 95(1), 2016, 17s-26s.
40. A. Raghavan, *T.A. Palmer*, K.C. Kragh-Buetow, A. Domask, E.W. Reutzel, S.E. Mohney, and T. DebRoy, “Employing Microsecond Pulses to Form Laser Fired Contact in Photovoltaic Devices”, *Progress in Photovoltaics: Research and Applications*, 23(8), 2015, 1025-1036.
41. M. Gouge, J.C. Heigel, P. Michaleris, and *T.A. Palmer*, “A Methodology for Implementing Thermal Convection in the Simulation of Laser Cladding Processes”, *International Journal of Advanced Manufacturing Technology*, 79(1-4), 2015, 307-320.
42. J.C. Heigel, P. Michaleris, and *T.A. Palmer*, “In Situ Monitoring and Characterization of Distortion During Laser Cladding of Inconel® 625”, *Journal of Materials Processing Technology*, 220, 2015, 135-145.
43. R.F. Hamilton, *T.A. Palmer,* and B.A. Bimber, “Spatial Characterization of the Thermal-Induced Phase Transformation Throughout As-deposited Additive Manufactured NiTi Bulk Builds”, *Scripta Materialia*, 101, 2015, 56-59.
44. H.L. Wei, J.J. Blecher, *T.A. Palmer*, and T. DebRoy, “Numerical Simulation of Hybrid Laser-GMA Full Penetration Welding of DH 36 Steel”, *Welding Journal (Research Supplement)*, 94(4), 2015, 135s-144s.
45. J.J. Blecher, *T.A. Palmer*, and T. DebRoy, “Mitigation of Root Defects in Laser and Hybrid Laser-Arc Welding”, *Welding Journal (Research Supplement)*, 94(3), 2015, 73s-82s.
46. B.E. Carroll, *T.A. Palmer*, and A.M. Beese, “Anisotropic Tensile Behavior of Ti-6Al-4V Components Fabricated with Directed Energy Deposition Additive Manufacturing”, *Acta Materialia*, 87, 2015, 309-320.
47. E.R. Denlinger, J.C. Heigel, P. Michaleris, and *T.A. Palmer*, “Effect of Inter-Layer Dwell Time on Distortion and Residual Stress in Additive Manufacturing of Titanium and Nickel Alloys”, *Journal of Materials Processing Technology*, 215, 2015, 123-131.
48. J.J. Blecher, C.M. Galbraith, C. Van Vlack, *T.A. Palmer*, J.M. Fraser, P.J.L. Webster, and T. DebRoy, “Real-Time Monitoring of Keyhole Depth by Laser Interferometry”, *Science and Technology of Welding and Joining*, 19(7), 2014, 560-564.
49. A. Raghavan, *T.A. Palmer*, and T. DebRoy, “Passivation Layer Breakdown During Laser-Fired Contact Formation for Photovoltaic Devices”, *Applied Physics Letters*, 105, 024105, 2014, doi: 10.1063/1.4890620.
50. J.J. Blecher, *T.A. Palmer*, and T. DebRoy, “Solidification Map of a Nickel Base Alloy”, *Metallurgical and Materials Transactions A*, 45A(4), 2014, 2142-2151.
51. A. Raghavan, *T.A Palmer*, A. Domask, S. Mohney, E.W. Reutzel, and T. DebRoy, “Role of Processing Parameters on Morphology, Resistance, and Composition of Laser Fired Contacts”, Proceedings of SPIE, 8826, 2013, Article Number UNSP 882606, DOI: 10.1117/12.2023978
52. J.J. Blecher, T.A. Palmer, and S.M. Kelly, “High Power Laser Characterization Using Beam Diagnostics”, Trends in Welding Research: Proceedings of the 9th International Conference, ed. by T. DebRoy, S.A. David, J.N. DuPont, T. Koseki, and H.K. Bhadeshia, 2013, pp. 55-59.
53. A. Raghavan, T.A. Palmer, and T. DebRoy, “Mathematical Modeling of Laser Micro-Welding for Photovoltaic Devices”, Trends in Welding Research: Proceedings of the 9th International Conference, ed. by T. DebRoy, S.A. David, J.N. DuPont, T. Koseki, and H.K. Bhadeshia, 2013, pp. 983-988.
54. Raghavan, H. Wei, *T.A. Palmer*, and T. DebRoy, “Heat Transfer and Fluid Flow in Additive Manufacturing”, *Journal of Laser Applications*, 25(5), 2013, 052006.
55. T.F. Lin, *T.A. Palmer*, K.C. Meinert, N.R. Murray, and R.P. Majeski, “Capillary Wicking of Liquid Lithium on Laser Textured Surfaces for Plasma Facing Components”, *Journal of Nuclear Materials*, 433(1-3), 2013, 55-65.
56. A. Raghavan, J.J. Blecher, *T.A Palmer*, E.W. Reutzel, and T. DebRoy, “Modeling Contact Geometry and Dopant Profile during Laser Silicon Interaction”, Proceedings of SPIE, 8473, 2012, Article Number 847304, DOI: 10.1117/12.933861.
57. J.J. Blecher, *T.A. Palmer*, and T. DebRoy, “Laser-Silicon Interaction for Selective Emitter Formation in Photovoltaics–Part I: Numerical Model and Validation”, *Journal of Applied Physics*, 112, 114906, 2012; doi: 10.1063/1.4768537.
58. J.J. Blecher, *T.A. Palmer*, E.W. Reutzel, and T. DebRoy, “Laser-Silicon Interaction for Selective Emitter Formation in Photovoltaics – Part II: Model Applications”, *Journal of Applied Physics*, 112, 114907, 2012; doi: 10.1063/1.4768540.
59. J.J. Blecher, *T.A. Palmer*, S.M. Kelly, and R.P. Martukanitz, “Identifying Performance Differences in Transmissive and Reflective Laser Optics using Beam Diagnostic Tools”, *Welding Journal (Research Supplement)*, 91(7), 2012, 204s-215s.
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61. *T.A. Palmer*, J.W. Elmer, P. Mayr, and E.D. Specht, “Direct Observation of Austenitization in 1005 C-Mn Steel during Continuous Heating Using In Situ Synchrotron X-Ray Diffraction”, *Science and Technology of Welding and Joining*, 16(5), 2011, 377-384.
62. P. Mayr, *T.A. Palmer*, J.W. Elmer, E.D. Specht, and S. Allen, “Formation of Delta Ferrite in 9 wt.% Cr Steel Investigated by In Situ X-ray Diffraction Using Synchrotron Radiation”, *Metallurgical and Materials Transactions A*, 41A(10), 2010, 2462-2465.
63. B. Ribic, *T.A. Palmer*, and T. DebRoy, “Problems and Issues in Laser-Arc Hybrid Welding”, *International Materials Reviews*, 54(4), 2009, 223-244.
64. R. Rai, *T.A. Palmer*, J.W. Elmer and T. DebRoy, “Heat Transfer and Fluid Flow During Electron Beam Welding of 304L Stainless Steel Alloy”, *Welding Journal (Research Supplement)*, 88(3), 2009, 54s-61s.
65. *T.A. Palmer* and J.W. Elmer, “Improving Process Control in Electron Beam Welding Using the Enhanced Modified Faraday Cup”, *Journal of Manufacturing Science and Engineering*, 130(4), 2008, 041008 (15 pages).
66. J.W. Elmer, *T.A. Palmer*, W. Zhang, and T. DebRoy, “Time Resolved X-Ray Diffraction Observations of Phase Transformations in Transient Arc Welds”, *Science and Technology of Welding and Joining*, 13(3), 2008, 265-277..
67. P. Mayr, *T.A. Palmer*, J.W. Elmer, and E.D. Specht, “Direct Observation of Phase Transformations in the Simulated Heat-Affected Zone of a 9 Cr Martensitic Steel”, *International Journal of Materials Research*, 99(4), 2008, 381-386.
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69. R. Rai, J. W. Elmer, *T. A. Palmer*, and T. DebRoy, “Heat Transfer and Fluid Flow during Keyhole Mode Laser Welding of Tantalum, Ti-6Al-4V, 304L Stainless Steel and Vanadium”, *Journal of Physics D: Applied Physics*, 40, 2007, 5753-5766.
70. J.W. Elmer and *T.A. Palmer*, “Direct Observations of Sigma Phase Formation in Duplex Stainless Steels Using In-Situ Synchrotron X-Ray Diffraction”, *Metallurgical and Materials Transactions A*, 38A(3), 2007, 464-475.
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72. *T.A. Palmer* and J.W. Elmer, “Characterization of Electron Beams at Different Focus Settings and Work Distances in Multiple Welders Using the Enhanced Modified Faraday Cup”, *Science and Technology of Welding and Joining*, 12(2), 2007, 161-174.
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**BOOK CHAPTERS**

1. M.C. Brennan, J.S. Keist, and T.A. Palmer, “Defects in Metal Additive Manufacturing Processes”, ASM Handbook, Volume 24, Additive Manufacturing Processes, 2020.
2. T.A. Palmer, P.W. Hochanadel, and K. Lachenberg, “Quality Control of Electron Beams and Welds”, ASM Handbook, Volume 6A, Welding and Joining, 2011.
3. J.O. Milewski and T.A. Palmer, “Laser Deposition Processes”, ASM Handbook, Volume 6A, Welding and Joining, 2011.

**EDITORSHIPS**

Guest Editor, Focus Issue: The Materials Science of Additive Manufacturing, *Journal of Materials Research*, 29(17), 2014.

**INVITED PRESENTATIONS**

*T.A. Palmer*, “Addressing Materials Challenges and Other Barriers to the Future of Additive Manufacturing”, FABTECH 2022 and American Welding Society Professional Program, November 8-10, 2022. (Plenary Talk)

*T.A. Palmer*, “Minor Alloying Element Variations and Microstructural Evolution in Additively Manufactured Materials”, Advances in Welding and Additive Manufacturing Research Conference, June 13-16, 2022, Virtual.

*T.A. Palmer, “*Role of Interstitial and Minor Alloying Element Additions on Microstructural Evolution in Additively Manufactured Materials”, TMS 2022: 150th Annual Meeting and Exposition, February 27-March 3, 2022, Anaheim, CA.

*T.A. Palmer, “*Impact of Metal Powders Feedstock on the Properties and Performance of Additively Manufactured Materials”, (Keynote), Holistic Innovation in Additive Manufacturing (HI-AM) Conference, June 25-26, 2020

*T.A. Palmer, “*Impact of Powder Feedstock Compositions on the Additive Manufacturing of Corrosion Resistant Alloys for Energy Applications”, TMS 2019: 148th Annual Meeting and Exposition, March 10-14, 2019, San Antonio, TX.

*T.A. Palmer,* “Additive Manufacturing of Metals: Current Status and Future Outlook”, (Keynote), TMS 2018: 147th Annual Meeting and Exposition, March 11-15, 2018, Phoenix, AZ.

*T.A. Palmer,* “Developing Powder Rheology Relationships for Characterization of Metal Powder Feedstocks Used in Additive Manufacturing”, (Invited), TMS 2018: 147th Annual Meeting and Exposition, March 11-15, 2018, Phoenix, AZ.

*T.A. Palmer*, “Developing Fundamental Scaling Relationships for Size and Geometry in Directed Energy Deposition Processes“, (Invited), Materials Science and Technology, 2016, October 24-27, 2016, Salt Lake City, UT.

*T.A. Palmer*, G.P. Dillon, R. Martukanitz, G. Messing, T. Simpson, R. Brindle, G. Hildeman, and J. Kosters, “Strategic Roadmapping for the Next Generation of Additive Manufacturing Materials”, (Invited), TMS 2016: 145th Annual Meeting and Exposition, February 14-18, 2016, Nashville, TN.

*T.A. Palmer*, G.P. Dillon, R. Martukanitz, G. Messing, T. Simpson, R. Brindle, G. Hildeman, and J. Kosters, “Strategic Roadmapping for the Next Generation of Additive Manufacturing Materials”, (Invited), Materials Science and Technology, 2015, October 4-7, 2015, Columbus, OH.

*T.A. Palmer*, J. Keist, and A. Beese, “Fundamental Processing-Structure-Property Relationships in Directed Energy Deposition of Nickel and Titanium Alloys”, (Invited), 2015 TMS 2015: 144th Annual Meeting and Exposition, March 15-19, 2015, Orlando, FL

*T.A. Palmer*, J. Keist, and R. Martukanitz, “Influence of Additive Manufacturing on Titanium Alloy Microstructures”, (Invited), Materials Science and Technology, 2014, October 12-16, 2014, Pittsburgh, PA.

*T.A. Palmer*, “Challenges and Opportunities in the Additive Manufacturing of Metals”, Timken “Engineering With Intent” Company-wide Webinar, November 18, 2014, sponsored by Timken, Inc.

*T.A. Palmer*, “Challenges in the Additive Manufacturing of Metals for Medical Devices”, 33rd Annual Medtronic Science and Technology Conference, October 30, 2014, sponsored by Medtronic, Inc. (Invited Keynote Speaker)

**DEVELOPMENT OF PEOPLE**

*Undergraduate Student Research/Honors Research*

|  |  |  |
| --- | --- | --- |
| **Student** | **Graduation** | **Placement After Graduation** |
| Jared Blecher  Penn State ARL Honors Student | 5/2010 | Graduate School (Penn State University) |
| Nile Koebler  McNair Fellow | 5/2011 | Graduate School (Cornell University) |
| Thomas J. Gonze | 5/2011 | Industry |
| Nicholas A. Virbitsky | 5/2011 | Industry |
| Brad A. Rex | 5/2014 | Industry |
| Mohamed Salman A. Kadhi | 5/2016 | Industry |
| Vatsal Agarwal | 5/2020 | Industry |
| Ian Wietecha-Reiman  Schreyers Honors Student | 5/2020 | Graduate School (Penn State University) |

*Master of Science Students*

|  |  |  |
| --- | --- | --- |
| **Student** | **Date of Graduation** | **Placement After Graduation** |
| Jared Blecher | 5/2012 | Ph.D. Program (Penn State) |
| Bryant Foster | 5/2015 | Oerlikon-Metco |
| James Hannah | 5/2017 | U.S. Navy |
| Zak Khayat | 12/2017 | Corning, Inc. |
| Scott Meredith | 1/2018 | Morgan Advanced Materials |
| Marissa Brennan | 5/2018 | General Electric |
| Derek Shaffer | 8/2020 | Ph.D. Program (Penn State) |
| Mingze Gao | 8/2020 | Ph.D. Program (Penn State) |
| Titus Reed | 12/2020 | Ph.D. Program (Penn State) |
| Ian Wietecha-Reiman | 5/2022 | Ph.D. Program (Penn State) |

*Supervision of Doctoral (PhD) Students*

|  |  |  |
| --- | --- | --- |
| **Student** | **Date of Graduation** | **Placement After Graduation** |
| Ashwin Raghavan | 8/14 | Pratt & Whitney |
| Michael Gouge | 12/15 | Autodesk, Inc. |
| Tuhin Mukherjee | 5/18 | Post-Doc (Penn State) |
| Jared Blecher | 5/19 | 3D Systems |
| James Zuback | 12/19 | Post-Doc (Penn State) |
| Skyler Hilburn | 8/20 | Air Force Research Laboratory |
| Gerald Knapp | 8/20 | Oak Ridge National Laboratory |
| Andrew Iams | 12/21 | National Institute of Standards and Technology |
| Derek Shaffer | 5/23 | Ellwood National Forge |
| Mingze Gao | 8/23 | Industry |
| Aaron Isaacson | 12/23 | Applied Research Laboratory, Penn State |
| Abhirup Saha | 5/24 | On-Going |
| Raghul Asok Kumar | 5/2024 | On-Going |
| Ian Wietecha-Reiman | 5/2025 | On-Going |
| Eric Andrewlavage | 5/2026 | On-Going |
| Nicholas Finch | 12/2025 | On-Going |

*Supervision of Post-Doctoral Scholars*

|  |  |  |
| --- | --- | --- |
| **Student** | **Dates** | **Placement After Graduation** |
| James Zuback | 9/19-2/20 | National Institute of Standards and Technology |
| Selda Nayir | 1/20-1/22 | Oak Ridge National Laboratory |