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ACADEMIC CREDENTIALS

- PhD in Nuclear Engineering, University of New Mexico, 2011. *Dissertation passed with distinction.*
- PhD in Philosophy and Apologetics, Trinity Seminary and College, 2005. *Dissertation passed with distinction.*
- M.S. in Applied Mathematics, University of New Mexico, 2004.
- University of New Mexico and Sandia National Laboratories Interdisciplinary Graduate Program: Scientific & Engineering Computation through the Center for Advanced Research Computing, 2000.
- M.S. in Mechanical Engineering, University of Idaho, 1993.
- B.S. in Nuclear Engineering, University of California at Santa Barbara, 1985.

SUMMARY OF PROFESSIONAL EXPERIENCE

- Principal Member of the Technical Staff at Sandia National Laboratories, 1995-present.
- Research Associate Professor at the University of New Mexico, 2012-2017.
- Member of the Technical Staff at Los Alamos National Laboratory, 1989-1995.
- Nuclear Reactor Operator/Engineer at Idaho National Laboratory, 1985-1989.

TOP TECHNICAL ACHIEVEMENTS

1. Awarded HENAAC 2023 *Scientist of the Year*. There is no higher award offered by HENAAC; this is the first time any Department of Energy national laboratory, including Sandia National Laboratories, wins this prestigious award.
2. US Patent 11,725,889 B1, based on SD 14916.1, was granted for “Refractory High Entropy Alloy Compact Heat Exchanger”, second author, August 2023.
3. Applied my surface dimpling copyright (SCR 2243.0) to a rocket nosecone surface. Smooth and dimpled rockets were flown at Mach 0.64 to compare their aerodynamic drag. Post-flight analysis of the flight test data show that the dimpled rocket had a drag coefficient that was 20.5% lower on average and had a peak reduction of 39.1% vs. the smooth rocket; 2023.
4. Project and technical lead for team that received the Sandia National Laboratories Division 8000 Employee Recognition Award for “Technical Excellence” for “High-Ductility Refractory High-Entropy Alloys for Advanced Energy and Aerospace Systems”, 2023.
5. Sole author, Springer Publishing book, *Applied Computational Fluid Dynamics and Turbulence Modeling*, ISBN 978-3-030-28690-3, 2019. www.cfdturbulence.com; featured at the American Institute of Aeronautics and Astronautics (AIAA) <https://arc.aiaa.org/doi/pdf/10.2514/1.J060595>. 20,000+ downloads, 76 countries, 175 universities, 4.8 out of 5 star review rating.
6. Lead author, “Towards More Ductile Refractory High-Entropy Alloys at Room Temperature”, 31st International Conference, Nuclear Energy for New Europe, Slovenia, SAND2022-11880C, 2022.

7. Lead for US Patent 11,434,551 B1, based on SD 15012.1, granted on September 6, 2022 for “High Entropy Alloys, Refractory High Entropy Alloys, Methods of Section and Making, and Structures Formed Thereof”.
8. Co-author for US Non-Provisional Patent application 63/332,777, “Wind Turbine Blades Having System Integrated Tip and Methods of Making Using Additive Manufacturing”, April 28, 2022.
9. Member of “The Sandian 300+” list of top, all-time Sandia National Laboratories inventors, 2021.
10. Lead author, “Theoretical Approach for the Fast and Easy Estimation of the Turbulent Kinematic Viscosity for Internal Flows”, ASME Journal of Nuclear Engineering and Radiation Science, 2021.
11. Project and technical lead for team that received the Outstanding Innovation award for NMSBA project “Metal Alloy and RHEA Additive Manufacturing for Nuclear Energy and Aerospace Applications”, Sandia National Laboratories, 2020.
12. US Patent 10,537,839 B1, based on SD 13453, was granted for “Low Pressure Drop Advanced Swirl Technology Gas Filter”, second author, August 2020.
13. Best Pitch Award and Audience Favorite Award, “Dimpling for Aerodynamic Drag Reduction”, Sandia National Labs I-Corps Competition, 2017.
14. Copyright SCR 2243.0, based on SD 14186, was granted for “Right-Sized Dimple Evaluator v. 2.0”, sole author, 2017.
15. Sandia National Laboratories, Lifelong Learner Award “in recognition of your lifelong pursuit of learning”, 2010.

EXPERIENCE SUMMARY

38 years’ experience in design, safety, and analysis of nuclear, non-nuclear, and aerodynamic systems. Key expertise areas include computational fluid dynamics (CFD), advanced high-temperature refractory high-entropy alloys, turbulence, aerodynamic drag reduction through surface modification, advanced manufacturing, swirl, and heat transfer. Design and modeling of gas, water, molten salt, and heavy-water cooled reactors—micro, small, and large reactors.

Key innovations in fluid dynamics include the development and application of the “right-sized” dimpling algorithm for reduced aerodynamic drag and increased heat transfer for energy and aerospace applications. Other accomplishments include the design and modeling of advanced nuclear reactors, solar heat collectors, and bio energy systems. Theoretical model development includes high-energy turbulence models, isotropic turbulence decay models, development of vortex models, and dynamic swirl for more environmentally-benign fuel-injector combustion engines.

Key innovations in advanced metal alloys include three patents for refractory high-entropy alloys (RHEAs) with yield strength that exceed Inconel 718. The RHEA material properties include high temperature (>1,273 K), self-healing, and harsh-environment survivability. Current research and development include the manufacturing of the world’s largest RHEA component, the production and testing of dozens of ductile and self-healing RHEAs, as well as molten-salt corrosion testing of RHEAs at 1,238 K.

Key innovations in nuclear reactors include the first-ever dynamic code (MELCOR-H2) for modeling hydrogen production of fully-integrated nuclear reactors, power conversion systems, and hydrogen-production systems. Team and technical leader for micro nuclear reactors, small modular reactors, and supercritical CO2 power conversion cycles. Key technical lead for the Foundational Infrastructure for Responsible use of SMR Technology (FIRST) Program. FIRST is a Department of State's international program for clean energy independence and security, the strengthening of strategic international links, and technical collaboration.

INTELLECTUAL PROPERTY

Technical Advances (TAs)

- Technical Advance SD 16047, “Dimpled Fractal Fins for Enhanced Heat Transfer”. **S. Rodriguez**, January 18, 2022.
- Technical Advance SD 16057, “Suppressing Radionuclide Releases and Corrosion in Nuclear Reactors”. **S. Rodriguez** and F. Gelbard, January 25, 2022.
- Technical Advance SD 15551, “Additive Manufactured, System Integrated Tip for Wind Turbine Blades”. B. Houchens, ..., **S. Rodriguez**, ..., August 28, 2020.
- Technical Advance SD 15348, “Methodology for Selecting and Manufacturing RHEAs for Low-, Intermediate-, and High-Temperature Systems”. **S. Rodriguez**, February 20, 2020.
- Technical Advance SD 15012, “Cost-Competitive RHEAs and HEAs for High Radiation, Temperature, Pressure, and Corrosion Environments”, **S. Rodriguez**, A. Kustas, and D. Ames, March 28, 2019.
- Technical Advance SD 14916, S 161594, “Refractory High Entropy Alloy (RHEA) Compact Heat Exchangers”. A Kustas, **S. Rodriguez**, ..., November 20, 2018.
- Technical Advance SD 14416, “Advanced Fire Sprinklers and Deflectors”. **S. Rodriguez**, May 16, 2017.
- Technical Advance SD 14614, “High Fidelity Thermo-Physical Database Tool for Alcohol/Non-Alcohol Beverages”. K. Armijo, ..., **S. Rodriguez**, ..., 2017.
- Technical Advance SD 14611, “Multiport Twist Widgets for Gasification of Beverages”. K. Armijo, ... **S. Rodriguez**, and J. N. Kruichak, 2018.
- Technical Advance SD 14266, S-147401, “A Substantial Pressure-Drop Design Criteria for Improved CHE Performance” (Compact Heat Exchanger Design Criteria for Minimum Pressure Drop), **S. Rodriguez** and D. Fleming, January 19, 2017.
- Technical Advance SD 14257, S 147367, “Design Criteria for Vibration-Induced Condensation Systems”. **S. Rodriguez**, December 21, 2016.
- Technical Advance SD 14186, S 147282, “Right-Sized Dimpling for Reduced Flow Drag and Increased Heat Transfer”. **S. Rodriguez**, October 24, 2016.
- Technical Advance SD 13452, “Using Swirl for Enhanced Water Condensation”. **S. Rodriguez**, January 27, 2015.
- Technical Advance SD 13451, “Increased Water Surface-Tension for Increased Crop Production”. **S. Rodriguez**, January 27, 2015.
- Technical Advance SD 10607, “Modeling of Transient Sulfur Iodine Chemistry”, **S. Rodriguez et al.**, 2007.

Copyrights

- Copyright SCR 2243.0, based on SD 14186, was granted for “Right-Sized Dimple Evaluator Version 2.0”, Sandia National Laboratories, **S. Rodriguez**, 2017. This is applicable to aerodynamic drag reduction and heat transfer increase for subsonic to hypersonic turbulent systems.
- Copyright SCR 116.1, based on SD 10607, was granted for “Modeling of Transient Sulfur Iodine Chemistry”, Sandia National Laboratories, **S. Rodriguez et al.**, 2007. This software is applicable to advanced reactors and SMRs for the generation of hydrogen fuel.

Patents

- US Patent 11,434,551 B1, based on SD 15012.1, was granted on September 6, 2022 for “High Entropy Alloys, Refractory High Entropy Alloys, Methods of Selecting and Making, and Structures Formed Thereof”. Authored by **S. Rodriguez**, A. Kustas, and D. Ames.
- US Patent 11,725,889 B1, based on SD 14916.1, was granted on August 15, 2023 for “Refractory High Entropy Alloy Compact Heat Exchanger”. Authored by A. Kustas, **S. Rodriguez**, S. Whetten, D. Fleming, N. Argibay, D. Hirschfeld, and L. Rapp.
- US Patent 10,537,839 B1 granted for “Low Pressure Drop Advanced Swirl Technology Gas Filter”. Authored by D. Fleming and **S. Rodriguez** on April 30, 2018.
- Submitted *Divisional Patent* application based on SD 15012.2 for “High Entropy Alloys, Refractory High Entropy Alloys, Methods of Selecting and Making, and Structures Formed Thereof”; **S. Rodriguez**, A. Kustas, and D. Ames. Patent pending.
- Submitted US Non-Provisional Patent application and International Patent Application via Patent International Treaty for “Wind Turbine Blades Having System Integrated Tip and Methods of Making Using Additive Manufacturing”. A US provisional patent was filed on April 20, 2022. Authored by B. Houchens, ..., **S. Rodriguez**, ..., on April 19, 2023. Patents pending.
- Submitted Provisional Patent application for “Methods and Apparatuses to Transport Thermal Energy Uniformly in High-Energy Physics Systems”, Texas A&M University and Sandia National Laboratories; N. Fathi,, **S. Rodriguez**, Patent pending.

PUBLICATIONS

1. 2023 **S. Rodriguez**, R. Sharpe, and R. Hrzich, “Heat Transfer Experiments for Length-Scaled Dimpled Surfaces”, Sandia National Laboratories, SAND2023-TBD.
2. 2023 **S. Rodriguez**, Amy Chen, and Aaron Overacker, “Convective Flow Modeling of the Eden Medical-Radioisotopes Small Modular Reactor”, Sandia National Laboratories, SAND2023-10162.
3. 2023 **S. Rodriguez et al.**, “Modeling of the General Atomics Fast Modular Reactor—Status Report for FY23”, Sandia National Laboratories, SAND2023-09815.
4. 2023 **S. Rodriguez et al.**, “Self-Healing and Machinable Refractory High-Entropy Alloys for Energy and Aerospace Applications”. Abstract submitted to the TMS 3rd World Congress on High Entropy Alloys, HEA2023, Sandia National Laboratories, SAND2023-06187A.
5. 2023 E. Lang, ..., **S. Rodriguez**..., “Deciphering Oxidation and Irradiation Performance of a Spark Plasma Sintered HfNbTaZr Alloy”. Abstract accepted for the 2024 TMS Annual Meeting & Exhibition for Nanostructured Materials in Extreme Environments II, invited paper, SAND2023-0783A.

6. 2023 **S. Rodriguez**, K. Maupin, and N. Fathi, “CFD Modeling of Advanced Small Modular Reactors under Natural Convection”, Sandia National Laboratories, SAND2023-08479PE.
7. 2023 **S. Rodriguez**, K. Maupin, and N. Fathi, “Derivation of a Fast-Running, Physics-Based Turbulence Model Using Machine Learning and Uncertainty Quantification”, Sandia National Laboratories, white paper, SAND-TBD.
8. 2023 **S. Rodriguez et al.**, “Mitigation of Airborne Pathogens Using High-Efficiency Particulate Absorbing Filters, Ultra-Violet C, and Simulant Aerosols”, Sandia National Laboratories, SAND2023-05662.
9. 2023 K. Schmidt, **S. Rodriguez**, and D. Ammerman, “Design of a Light-Weight Drag Enhancer to Limit Terminal Velocity of a Large Air Transport Container”, Proceedings of the 20th International Symposium on the Packaging and Transportation of Radioactive Materials, PATRAM 22, June 2023, France. Sandia National Laboratories SAND2023-04073C and SAND2023-04282C.
10. 2023 H. Choi, ..., **S. Rodriguez**, ..., “Fast Modular Reactor Conceptual Design Status”, Proceedings of the International Congress on Advances in Nuclear Power Plants, Korea, Paper 2023174, April 2023, Tracking Number 1695134.
11. 2023 **S. Rodriguez** and J. Cash, “Investigation, Analysis, and Resolution of Go To Usage in the NORSE Code for the Norse/Clamp Interface and Clamp Module”, Sandia National Laboratories.
12. 2023 J. Cash and **S. Rodriguez**, “NORSE Source Code Improvements”, Sandia National Laboratories.
13. 2023 **S. Rodriguez**, “Nuclear Reactor Safety in a Brave New World”, presented at Sandia National Laboratories for the West Point Military Academy, SAND2023-13006PE.
14. 2023 E. Barrick, ..., **S. Rodriguez**, ..., “Laser Beam Directed Energy Deposition Fabrication of Novel Refractory High Entropy Alloys”, for the “Advanced Engineering Materials Workshop”, Lawrence Livermore National Laboratory, April 2023, SAND2023-01196D.
15. 2023 **S. Rodriguez et al.**, “Severe Weather Prediction and Quantification for Increased Nuclear Reactor Safety Using Upgraded Natural Circulation Models”, Sandia National Laboratories.
16. 2023 **S. Rodriguez et al.**, “Ultra-Violet C and Air Filtration Devices for Bio-Aerosol Pathogen Mitigation”, Sandia National Laboratories, SAND2023-08735.
17. 2022 E. Lang, ..., and **S. Rodriguez**, “Compositional Effects of Additively Manufactured Refractory High-Entropy Alloys Under High Energy Helium Irradiation”, Materials Journal, special issue: Advances in Radiation-Induced Nanostructuring of Materials, SAND2022-8366J.
18. 2022 **S. Rodriguez**, “Advanced Manufacturing of Refractory High-Entropy Alloys (RHEAs) Using Binder Jetting (BJG)”, Sandia National Laboratories.
19. 2022 **S. Rodriguez et al.**, “Towards More Ductile Refractory High-Entropy Alloys at Room Temperature”, 31st International Conference, Nuclear Energy for New Europe, Slovenia, SAND2022-8161A, SAND2022-11880C, SAND2022-11912C.
20. 2022 **S. Rodriguez**, S. Dixit, and R. Dixit, “Bimetallic Refractory High-Entropy Thick Alloy Coatings for Corrosion-Resistant, Liquid-Cooled, High Temperature Reactor Components”, Sandia National Laboratories.

21. 2022 **S. Rodriguez**, “The Advent of Micro, Small, and Advanced Reactors”, Sandia National Laboratories, SAND2022-16506PR.
22. 2022 **S. Rodriguez**, G. Monroe, and A. Chen, “Computational Fluid Dynamics and Heat Transfer Modeling of a Dimpled Heat Exchanger”, Sandia National Laboratories, SAND2022-14458.
23. 2022 **S. Rodriguez et al.**, “Fractal-Fin, Dimpled Solar Heat Collector with Solar Glaze”, Sandia National Laboratories, SAND2022-12752.
24. 2022 **S. Rodriguez**, “Dimpled Fractal Fins for Enhanced Heat Transfer”, Sandia National Laboratories, Technical Advance SD 16047.
25. 2022 **S. Rodriguez et al.**, “Modeling of the Fast Modular Reactor—Status Report for FY 22”, Sandia National Laboratories, Tracking Number 1619133.
26. 2022 **S. Rodriguez**, “Refractory High-Entropy Alloy Applications at Sandia National Laboratories”, Sandia National Laboratories, SAND2022-1553PE.
27. 2022 **S. Rodriguez** and S. Dixit, “Application of Refractory High-Entropy Alloy Coatings for Higher-Performance Small Modular Reactors”, Sandia National Laboratories, SAND2022-6723A.
28. 2022 **S. Rodriguez** and G. Monroe, “Fast-Paced Methodology for the Design, Manufacture, and Testing of Engineered, High-Mach Surfaces”, Sandia National Laboratories.
29. 2022 **S. Rodriguez**, “Potential Small Modular Reactor Sites for Estonia”, Sandia National Laboratories, SAND2022-8358C.
30. 2022 **S. Rodriguez et al.**, “Additive Manufactured, System-Integrated Tip (AMSIT) Advisory Meeting”, Sandia National Laboratories, SAND2022-2148O.
31. 2022 J. Pegues, ..., **S. Rodriguez**, ..., “Laser Beam Directed Energy Deposition Process Optimization for Refractory High Entropy Alloys (RHEAs)”, SAND2022-2338C.
32. 2022 **S. Rodriguez et al.**, “Sandia National Laboratories Response to Request for Information (RFI) on Water Research and Development for Produced Water and Legacy Wastewaters Associated with Thermal Power Plants”, Sandia National Laboratories, Tracking Number 1653068.
33. 2021 S. Rodriguez, G. Monroe, A. Chen, and R. Sharpe, “Smart Devices, Building Design, and Operation for Effective Bio-Aerosol Pathogen Mitigation”, Sandia National Laboratories, SAND2021-15953.
34. 2021 **S. Rodriguez**, N. Fathi, and M. Pourghasemi, “Theoretical Approach for the Fast and Easy Estimation of the Turbulent Kinematic Viscosity for Internal Flows”, ASME Journal of Nuclear Engineering and Radiation Science, SAND2020-10739J.
35. 2021 **S. Rodriguez et al.**, “Application of Refractory High-Entropy Alloys for Higher-Reliability and Higher-Efficiency Brayton Cycles and Advanced Nuclear Reactors”, Sandia National Laboratories, SAND2021-11377.
36. 2021 S. Dixit, **S. Rodriguez**, ..., “Refractory High-Entropy Alloy Coatings for High Temperature Aerospace and Energy Applications”, Journal of Thermal Spray Technology, Vol. 31, No. 4, pp 1021-1031, JTST-21-11-4870.R1, <https://doi.org/10.1007/s11666-022-01324-0>, SAND2021-15954J.
37. 2021 E. Lang, ..., **S. Rodriguez**, ..., “Understanding Combined Radiation Effects in Novel Refractory High Entropy Alloys”, Materials in Nuclear Energy Systems, SAND2021-4037A.

38. 2021 **S. Rodriguez** *et al.*, “Computational and Experimental Validation of Fractal-Fin, Dimpled Solar Heat Collector”, Sandia National Laboratories, SAND2021-15427.
39. 2021 **S. Rodriguez**, “Hotel Room Computational Fluid Dynamics to Investigate Airborne Pathogen Dispersal Patterns”, Sandia National Laboratories, SAND2021-0205.
40. 2021 M. Pourghasemi, ..., **S. Rodriguez**, ..., “Heat Transfer Performance of Small-Scale Heat Sinks Due to Variation of the Peclet Number and Wall Hydrophobicity”, Journal of Applied Energy, Sandia National Laboratories Tracking Number 1292349.
41. 2021 **S. Rodriguez** and F. Gelbard, “Novel Coatings for Suppressing Radionuclide Releases and Increasing Corrosion Protection for Critical Components in Advanced Nuclear Reactors”, Sandia National Laboratories, white paper.
42. 2021 E. Barrick, ..., **S. Rodriguez**, ..., “Laser Beam Directed Energy Deposition Process Optimization for Refractory High Entropy Alloys”, Minerals, Metals & Materials Society, TMS 2022 for the “AM of Refractory Alloys” Symposium, Abstract, SAND2021-8275A.
43. 2021 A. Kustas and **S. Rodriguez**, “Refractory High-Entropy Alloy (RHEA) Compact Heat Exchanger”, Sandia National Laboratories, SAND2021-12652M.
44. 2021 **S. Rodriguez**, “Sandia National Labs Refractory Superalloy Applications for Supercritical Brayton Cycles”, Sandia National Laboratories, SAND2021-2003PR.
45. 2021 G. Monroe and **S. Rodriguez**, “Aerodynamic Dimpling Distribution for a Rocket Nosecone, Blueprints”, Sandia National Laboratories, SAND2021-4564PR.
46. 2021 **S. Rodriguez**, “Refractory High Entropy Thin Films for High Temperature Aerospace and Energy Applications”, Sandia National Laboratories, SAND2021-5722A.
47. 2021 N. Argibay, ..., **S. Rodriguez**, ..., “Refractory High-Entropy Thin Coatings for High Temperature Aerospace and Energy Applications”, Sandia National Laboratories, Tracking Number 1344125.
48. 2021 **S. Rodriguez**, “The SNL Advanced Reactor Concepts-20 (ARC-20) Fast Modular Reactor Project, Draft”, Sandia National Laboratories, Tracking Number 1427545.
49. 2021 C. Mendez, ..., and **S. Rodriguez**, “Summary of FY21 STEP Accomplishments”, Sandia National Laboratories, Tracking Number 1357063.
50. 2021 M. Pourghasemi, N. Fathi, and **S. Rodriguez**, “Numerical Study on Flow and Heat Transfer of Water and Liquid Metals within Micro-Scale Heat Sinks for High Heat Dissipation Rate Applications”, 29th International Conference Nuclear Energy for New Europe, Slovenia, Tracking Number 1208913.
51. 2020 **S. Rodriguez**, A. Kustas, and G. Monroe, “Metal Alloy and RHEA Additive Manufacturing for Nuclear Energy and Aerospace Applications”, Sandia National Laboratories, SAND2020-7244.
52. 2020 **S. Rodriguez**, G. Monroe, and J. Fort, “Dimpled Heat Exchanger CFD and Heat Transfer Design and Analysis”, Sandia National Laboratories.
53. 2020 **S. Rodriguez**, “Dimpled and Undimpled Fractal Fin Solar Heat Collector”, Sandia National Laboratories.
54. 2020 **S. Rodriguez**, G. Monroe, and A. Chen, “CFD and Heat Transfer Modeling of a Greenhouse Coupled onto a House”, Sandia National Laboratories.
55. 2020 B. Houchens, ..., **S. Rodriguez**, ..., “Additive Manufactured, System Integrated Tip for Wind Turbine Blades”, Sandia National Laboratories, Tracking Number 1704207.

56. 2020 **S. Rodriguez**, G. Monroe, and N. Grieb, “Computational Fluid Dynamics and Large-Deformation Structural Analysis of AP-1000 and Related Containments”, Sandia National Laboratories, Tracking Number 1208237.
57. 2020, **S. Rodriguez**, “Small Lead Nuclear Reactor Coupled to an sCO₂ Brayton Loop”, Sandia National Laboratories.
58. 2020 **S. Rodriguez**, “Technical Areas where SNL can Leverage its Expertise for the eVinci vSMR and Advanced Reactors”, Sandia National Laboratories, SAND2018-131490.
59. 2020 **S. Rodriguez et al.**, “SNL Review of LANL Microreactor Test Article”, Sandia National Laboratories, SAND2020-1375.
60. 2020 **S. Rodriguez**, “Applying Quantum Computing Algorithms for Grid Resilience—Real-Time Solutions for Weather/Grid Network Issues”, Sandia National Laboratories.
61. 2019 **S. Rodriguez**, Springer Publishing book, *Applied Computational Fluid Dynamics and Turbulence Modeling*, ISBN 978-3-030-28690-3. www.cfdturbulence.com; <https://arc.aiaa.org/doi/pdf/10.2514/1.J060595>, SAND2017-13577B.
62. 2019 **S. Rodriguez**, “High-Temperature, Self-Healing Advanced Superalloy Components for High-Performance Reactors”, Sandia National Laboratories, Tracking Number 1067857.
63. 2019 **S. Rodriguez et al.**, “G2C Snowflake Deflector Design Optimization”, Sandia National Laboratories, SAND2019-7817.
64. 2019 **S. Rodriguez**, G. Monroe, and A. Chen, “Tucumcari Methane Plant: Increased Mixing, Viscosity Red Line, and Foam/Debris Mitigation”, Sandia National Laboratories.
65. 2019 **S. Rodriguez**, A. Chen, and K. Maupin, “Tucumcari Methane Production Plant: Validation at the Bench-, 1/10th-, and 1/3rd-Scale”, Sandia National Laboratories, SAND2019-9882.
66. 2019 **S. Rodriguez**, C. Mueller, and G. Monroe, “Walking Trout Greenhouse CFD, Thermal Analysis, and Passive Mechanisms”, Sandia National Laboratories.
67. 2019 **S. Rodriguez**, “sCO₂-Heat Pipe Compact Heat Exchanger Design and Experimental Validation”, Sandia National Laboratories, SAND2019-7091PR.
68. 2019 **S. Rodriguez**, “Pathway for Cost-Effective Nuclear Energy: Merger of an Innovative sCO₂ Recompression Brayton Cycle, Advanced Manufacturing, and High Performance Modeling”, Sandia National Laboratories, SAND2019-7092PR.
69. 2019 **S. Rodriguez**, “Advanced Manufacturing of Refractory High Entropy Alloys for Cost-Effective, High Temperature and Pressure Heat Exchangers”, Sandia National Laboratories, SAND2019-7090PR.
70. 2019 **S. Rodriguez**, “Validation and Verification for the Right Sized Dimpling Technology”, Sandia National Laboratories, SAND2019-7194PR.
71. 2019 H. Yoon, ..., **S. Rodriguez**, ..., “Advanced Turbulence Nitrogen Dosing Device for Beverages”, Sandia National Laboratories, SAND2019-0766.
72. 2019 **S. Rodriguez**, “Computational Multiphysics, Engineered Surfaces, and Next-Generation Advanced Reactor Materials”, Sandia National Laboratories, SAND2019-1960D.
73. 2019 K. Austin, ..., **S. Rodriguez**, ..., “Z Line-VISAR: Spatially Resolved Load Current Diagnostic at the Z Pulsed Power Facility”, Sandia National Laboratories, SAND2019-7210A.

74. 2019 **S. Rodriguez**, A. Kustas, and D. Ames, “Cost-Competitive Super-Alloys for High Radiation, Temperature, Pressure, and Corrosive Environments”, Sandia National Laboratories, SAND2019-4257C.
75. 2019 **S. Rodriguez**, “Develop a Comprehensive, Succinct Snapshot of Key, Universal Microreactor/SMR Safety and Security Features”, Sandia National Laboratories, SAND2019-7093PR.
76. 2019 **S. Rodriguez**, “Refractory High Entropy Alloys for Cost-Effective, Corrosion- and Pit-Resistant sCO₂ Turbine Nozzles”, Sandia National Laboratories, SAND2019-12216O.
77. 2019 **S. Rodriguez**, “Cost-Competitive Super-Alloys for High-Performance Energy Systems and Aerospace Applications”, Sandia National Laboratories, SAND2019-12861PR, SAND2019-14206PR.
78. 2018 **S. Rodriguez et al.**, “Snowflake Deflector Design and Optimization”, Sandia National Laboratories.
79. 2018 **S. Rodriguez**, A. Chen, and K. Maupin, “Tucumcari Methane Plant Bench-Scale Testing and Plant Modeling”, Sandia National Laboratories.
80. 2018 G. Rochau and **S. Rodriguez**, “Consortium for Rapid Heat-Pipe Reactor Deployment”, Sandia National Laboratories.
81. 2018 K. Armijo, ..., **S. Rodriguez**, ..., “Liquid Nitrogen Dosing for Inline Beverage Packaging”, Sandia National Laboratories, SAND2018-2342.
82. 2018 G. Rochau, **S. Rodriguez**, and D. Fleming, “sCO₂ Power Conversion, Heat Pipe Reactor Interface, and Merlin Brayton Cycle”, Sandia National Laboratories, SAND2016-12723PR, SAND2018-9849PR.
83. 2018 **S. Rodriguez et al.**, “Design and Implementation of Miniature Nuclear Reactors (vSMRs)”, Sandia National Laboratories, SAND2015-6810 C and SAND2018-9849PR.
84. 2018 **S. Rodriguez et al.**, “EM2 Reactor, PCU, and Load Balancing Development and Modeling”, Sandia National Laboratories, SAND2018-8665PE.
85. 2018 D. Fleming, ..., **S. Rodriguez**, ..., “Supercritical CO₂ Heat Exchanger Fouling and its Impact on RCBC Efficiency”, Proceedings of the ASME Pressure Vessels and Piping Conference, Czech Republic, PVP2018-84091, SAND2018-3610C.
86. 2018 D. Wilson, ..., **S. Rodriguez**, and D. Fleming, “HiEff/Petra Nova Combined Cycle Power Generation System”, Sandia National Laboratories and University of Texas at Arlington, SAND2018-7850P.
87. 2018 N. Fathi, ..., **S. Rodriguez**, ..., “Efficiency Enhancement of Solar Chimney Power Plant by Use of Waste Heat from Nuclear Power Plant”, Journal of Cleaner Production, Vol. 180, pp. 407-416.
88. 2017 **S. Rodriguez** and A. Chen, “Advanced Fire Sprinkler Design and Validation”, Sandia National Laboratories, May 2017.
89. 2017 **S. Rodriguez**, “Macro, Micro, Nano, and Bio 3D Printing”, CyberCon 2 Conference, San Juan College, April 2017.
90. 2017 **S. Rodriguez**, C. Mueller, and B. Riedel, “Advanced Swamp Cooler”, Sandia National Laboratories.
91. 2017 **S. Rodriguez**, N. Grieb, and A. Chen, “Dimpling Aerodynamics for a Ford Mustang GT”, Sandia National Laboratories, SAND2017-6522.

92. 2017 **S. Rodriguez** *et al.*, “Thunder Scientific Heat Exchanger Analysis”, Sandia National Laboratories.
93. 2017 **S. Rodriguez** and B. Merryman, “Fire Sprinkler System Modeling and Design”, Sandia National Laboratories, May 2017.
94. 2017 **S. Rodriguez**, A. Chen, and C. Mueller, “Tucumcari Methane Plant Analysis”, Sandia National Laboratories.
95. 2017 **S. Rodriguez** *et al.*, “6630 Experiment Planning”, Sandia National Laboratories, SAND2017-11765O.
96. 2017 **S. Rodriguez**, “Optimized Surface Dimpling for Commercial Vehicles, Aircraft, and Energy Applications” for Innovate New Mexico Technology Showcase, Sandia National Laboratories, SAND2017-10990 M.
97. 2017 **S. Rodriguez**, “Computational Fluid Dynamics (CFD) Modeling of sCO₂ Systems”, Sandia National Laboratories.
98. 2017 T. Grunloh, ..., **S. Rodriguez**, ..., “PIV-Validated RANS Turbulence Modeling for Buoyant Supercritical CO₂ Flow”, DOE-ROCSTAR-17236-1.
99. 2017 K. Armijo, ..., **S. Rodriguez**, ..., “Arc-Fault Primer: Numerical, Analytical, and Experimental Characteristics of Initiation and Sustainment of Arc Plasmas,” SAND2017-1019.
100. 2017 **S. Rodriguez** *et al.*, “Advancing Molten Salts and Fuels at Sandia National Laboratories”, Sandia National Laboratories, SAND2017-10478R.
101. 2017 **S. Rodriguez**, “Current Capabilities at SNL for the Integration of Small Modular Reactors onto Smart Microgrids Using Sandia’s Smart Microgrid Technology, High Performance Computing, and Advanced Manufacturing”, Sandia National Laboratories, SAND2017-5537R.
102. 2017 **S. Rodriguez**, “Waterless Waste-Heat Rejection using Semi-Passive, Economical Mechanisms”, Sandia National Laboratories.
103. 2017 **S. Rodriguez**, “Rapid and Economical Design, Computational Fluid Dynamics, and Experimental Validation of an Advanced Fire Sprinkler Design”, Sandia National Laboratories.
104. 2017 **S. Rodriguez**, “Smart Grid Design, Development, and Cyber Security for Small Modular Reactors”, Sandia National Laboratories, SAND2017-4345C.
105. 2017 **S. Rodriguez**, “SMR-Powered Smart Grids”, Sandia National Laboratories.
106. 2017 K. Armijo, ..., **S. Rodriguez**, ..., “Electrical Discharge Characterization Tool for High-Voltage Arc-Flash Phenomena”, Sandia National Laboratories, SAND2017-1840O.
107. 2017 **S. Rodriguez**, “Dimpling of Surfaces for Aerodynamic Drag Reduction”, Sandia National Laboratories, SAND2017-11616PE.
108. 2017 **S. Rodriguez**, “Right-Sized Dimple Evaluator V. 2.0”, Sandia National Laboratories, SAND2017-11212M.
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AWARDS

- 2023 Awarded HENAAC *Scientist of the Year*. There is no higher award offered by HENAAC; this is the first time any Department of Energy national laboratory, including Sandia National Laboratories, wins this prestigious award. Per the selection committee, “Leaders considered for this honor are meeting the demands of today’s rapidly advancing technology and dynamic economic environment. They have mastered the art of managing multi-skilled teams to solve complex technical and business problems.”
- 2023 Awarded Peer-to-Peer Recognition of Excellence, Thunderbird Kudos Award at SNL for providing the Department of State FIRST Ghana/Kenya delegation a discussion of SMRs and RHEAs.
- 2023 Selected by Sandia National Laboratories as top candidate for the HENAAC Outstanding Technical Achievement Award.

2023 Technical Excellence Employee Recognition Award winner for Division 8000 “High-Ductility Refractory High-Entropy Alloys for Advanced Energy and Aerospace Systems”, Sandia National Laboratories; project and technical lead.

2023 Awarded Peer-to-Peer Recognition of Excellence, Thunderbird Kudos Award at SNL, “For going above and beyond preparing and delivering an excellent presentation for the West Point cadets and professors”.

2023 Awarded Peer-to-Peer Recognition of Excellence Thunderbird Kudos Award at SNL, “For delivering a great presentation to our visitors from West Point Military Academy!”.

2021 Member of “The Sandian 300+” list of top, all-time Sandia National Laboratories inventors.

2021 “Outstanding Innovation” Award from Intellectual Property Management at Sandia National Laboratories, “in recognition for innovative culture and Intellectual Property generation for ‘High entropy alloys, refractory high entropy alloys, methods of selecting and making, and structures formed thereof”.

2020 Outstanding Innovation for NMSBA Project, “Metal Alloy and RHEA Additive Manufacturing for Nuclear Energy and Aerospace Applications”, Sandia National Laboratories, project lead.

2020 Book of the month for “*Applied Computational Fluid Dynamics and Turbulence Modeling*” September 2020, OnlineBookClub.org.

2017 Outstanding Innovation Award for NMSBA Project, “Computational Fluid Dynamics of the Tucumcari Methane Plant”, Sandia National Laboratories.

2017 Best Pitch Award, “Dimpling for Aerodynamic Drag Reduction”, Sandia National Laboratories I-Corps Competition.

2017 Audience Favorite Award, “Dimpling for Aerodynamic Drag Reduction”, Sandia National Laboratories I-Corps Competition.

2017 Spring Cohort of TechSprint winner, Arrowhead Center, New Mexico State University, for “Right-Sized Dimpling for Drag Reduction in the Domestic Automotive Industry”, March 27, 2017.

2016 Employee Recognition Award winner for “AWG-711 Special Nuclear Material Air Transport Package Design Team”, Sandia National Laboratories.

2015 Wall of Achievement Award for “Cold-Agriculture Process Validation and Verification using Computational Fluid Dynamics and Greenhouse”, Sandia National Laboratories.

2014 Awarded black belt in Okinawa-Style karate by Iron Olympians.

2014 One Albuquerque Volunteer Award for the Sandia Science Club, signed by Mayor Richard Berry.

2013 Awarded the President’s Volunteer Service Award, signed by US President Obama.

2012 Employee Recognition Award Nomination for “Consortium for the Advanced Simulation of Light-Water Reactors” Project, Sandia National Laboratories.

2011 Letter of Academic Title, Department of Chemical and Nuclear Engineering, University of New Mexico.

2011 Ph.D. NE dissertation pass with distinction.

- 2010 Awarded “Lifelong Learner Award” by Sandia National Laboratories, “in recognition of your lifelong pursuit of learning”.
- 2009 Certificate of Recognition for volunteer appreciation, Manzano Mesa Elementary School, Albuquerque, NM.
- 2008 Employee Recognition Award with grateful appreciation for meritorious achievement for “MELCOR-H2: Large-Scale Production of Hydrogen Using Nuclear Reactors”, Sandia National Laboratories.
- 2007 Laboratory Directed Research & Development, Award for Excellence Honorable Mention, in Recognition of Excellence in R&D for “Development of Design and Simulation Model for Large Scale Hydrogen Production Using Nuclear Power”, Sandia National Laboratories.
- 2007 Employee Recognition Award Nomination “in recognition of excellence in R&D” for “Large-Scale Production of Hydrogen Using Nuclear Reactors”, Sandia National Laboratories.
- 2006 Employee Recognition Award Nomination for “Heat Transfer Experimental Team”, Sandia National Laboratories.
- 2006 National Omicron-Psi Honor Society Distinction of Honor “in recognition of community service and scholastic promise”.
- 2006 Ph.D. in Philosophy and Apologetics, dissertation pass with distinction.
- 2004 Employee Recognition Award Nomination for “High-Speed Jet Fuel Impact and Dispersion Team”, Sandia National Laboratories.
- 2004 Employee Recognition Award Nomination for “Nuclear Power Plant Vulnerability Analysis Team”, Sandia National Laboratories.
- 2004 Certificate of Recognition from the Hispanic community of the University of New Mexico for “achieved merits during his university studies”.
- 2003 United States Nuclear Regulatory Commission, Certificate of Appreciation, “In recognition of your dedication and commitment to excellence in supporting the assessment of the potential vulnerability of nuclear power plants to aircraft attack and identification of mitigation strategies, which resulted in a significant contribution of the work of the Nuclear Regulatory Commission and the security of the United States of America”, Ashok C. Thadani, Director, Office of Nuclear Regulatory Research.
- 2001 Accelerated Strategic Computing Initiative Award for “Three Dimensional Normal Environment”, Sandia National Laboratories.
- 1993 American Nuclear Society author recognition for “Safety Evaluation of Core Components Exposed to Air During an LBLOCA”. “This certificate of recognition is in appreciation of the work, effort, and enthusiasm shown in the preparation and presentation of this paper, which is a tribute to the engineering profession and the American Nuclear Society”.
- 1988 Nuclear Experimental Power Reactor Operator Certification for the Advanced Test Reactor, Idaho National Laboratory.
- 1986 Loop Experimental Power Reactor Operator Certification for the Advanced Test Reactor, Idaho National Laboratory.
- 1985 Basic Experimental Power Reactor Operator Certification for the Advanced Test Reactor, Idaho National Laboratory.
- 1981 Bank of America “Math and Science Achievement Award”.

PROFESIONAL SERVICE, MEMBERSHIPS

- Founder and presenter for the Sandia Science Club at Manzano Mesa Elementary School, New Mexico. Presentations include aerodynamics, nano technology, 3D printing, chaos theory, crystallography, biology, chemistry, and mathematics.
- Standards Committee Member for the American Nuclear Society
- Member of the American Nuclear Society
- Member of the American Institute of Aeronautics and Astronautics
- Lifetime member of the Society of Hispanic Professional Engineers
- Team Member of the “Journal of the Minerals, Metals & Materials Society” associated with the peer review of advanced materials for high-temperature alloys and next-generation superalloys.
- Reviewer for the American Society of Mechanical Engineers
- Reviewer for the Department of Energy’s Nuclear Energy University Program
- Member of the Department of Energy’s “Lab Partnering Services”, providing guidance in CFD and turbulence modeling
- Reviewer for the New Mexico Clean Energy Resilience and Growth Project
- Presenter for the Sandia National Laboratories MANOS program, which is a hands-on Science and Engineering Program for Hispanic and minority middle school students
- “Noche de Ciencias” participant for Sandia National Laboratories/SHPE
- Member of the Family Advisory Council for Albuquerque Public Schools, New Mexico.
- Member of the WatchDOGS Program
- Member of the Manzano Mesa Elementary school board, New Mexico
- Panelist member for the University of New Mexico speaker series, “Pizza with Professionals”
- Guest speaker for Manzano Elementary School, Wilson Middle School, and Calxico High School.

RESEARCH TOOLS/MISC. EXPERIENCE

- Demonstrated success in multiple engineering fields, proposal writing, technical writing, team collaboration, and leading teams.
- Not afraid to think outside the box.
- Thrives on challenges.
- Self-driven, while being team player.
- Enjoys mentoring, gifted ability to teach.
- Computational fluid dynamics, Multiphysics, and high-performance parallel computing using Fuego, Nalu, Calore, ALEGRA, MELCOR, RELAP5, TRAC, and HERA.
- Matlab, Maple, ParaView, Cubit; Windows, UNIX systems.
- Programming: decent FORTRAN and some C++.
- Fluent in English and Spanish; basic French and some Russian.