Exponent®
Engineering & Scientific Consulting

Nick Kincaid, Ph.D.

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Professional Profile

Dr. Kincaid is a mechanical engineer in Exponent's Thermal Sciences practice with a background in fluid dynamics, thermodynamics, and heat transfer. He specializes in turbulent combustion, computational fluid dynamics (CFD), chemical kinetic modeling, and machine learning.

Dr. Kincaid has extensive experience in simulating turbulent flames, including direct numerical simulations (DNS) and large eddy scale (LES) turbulence modeling. He has experience in implementing numerical methods for chemical reactions in existing CFD codes. He also has experience in numerical methods for simulating multiphase flows including solid particle-laden flows, and liquid-gas flows.

Dr. Kincaid is proficient in coding in Fortran, C++, Python, and MATLAB. He has extensive experience with the chemical kinetic modeling software Cantera, as well as several commercial CFD codes including Ansys Fluent and COMSOL.

Prior to joining Exponent, Dr. Kincaid was a graduate researcher in the Mechanical and Aerospace Department at Cornell University where he developed reduced-order chemical kinetic models to reduce the computational cost of reacting flow simulations. During his Ph.D. research, he developed a framework to represent and robustly simulate the chemical kinetics of a sustainable aviation fuel with artificial neural networks. He also developed a new mechanism reduction methodology for plasma-assisted combustion (PAC) technologies.

Prior to his Ph.D., Dr. Kincaid worked at the National Renewable Energy Lab (NREL) as a Thermal Systems Intern where he developed thermal and optical models for concentrated solar power plants. Dr. Kincaid also has experience with HVAC equipment, building energy modeling, and renewable energy systems.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, Cornell University, 2024

B.S., Mechanical Engineering, Colorado School of Mines, 2017

Office of Science Graduate Student Research Fellowship, 2022

NSF Graduate Research Fellowship, 2019

Sibley Prize for Excellence in Graduate Teaching Assistance, 2019

Tau Beta Pi Engineering Honor Society, 2017

Best Poster Award, Colorado School of Mines Graduate Research and Discovery Symposium, 2017

Prior Experience

Graduate Research Assistant, Cornell University, 2018-2024

Graduate Student Intern, National Renewable Energy Lab, 2023

Thermal Systems Engineering Intern, National Renewable Energy Lab, 2017-2018

Publications

R. Heisser, C. Aubin, O. Peretz, N. Kincaid, H. Seok An, E. Fisher, S. Sobhani, P. Pepiot, A. Gat, R. Shepherd. “Valveless microliter combustion for densely packed arrays of powerful soft actuators.” Proceedings of the National Academy of Sciences, 2021

A. Bellemans, N. Kincaid, N. Deak, P. Pepiot, and F. Bisetti. P-DRGEP: a novel methodology for the reduction of kinetics mechanisms for plasma-assisted combustion applications. Proceedings of the Combustion Institute, 2020

J. McTigue, D. Wendt, K. Kitz, J. Gunderson, N. Kincaid, and G. Zhu. Assessing geothermal/solar hybridization – Integrating a solar thermal topping cycle into a geothermal bottoming cycle with energy storage. Applied Thermal Engineering, 2020

N. Kincaid, G. Mungas, N. Kramer, and G. Zhu. Sensitivity analysis on optical performance of a novel linear Fresnel concentrating solar power collector. Solar Energy, 2019

J. Mctigue, J. Castro, G. Mungas, J. King, N. Kramer, D. Wendt, K. Kitz, J. Gunderson, C. Turchi, N. Kincaid, and G. Zhu. Techno-economic Assessment of Geothermal Power Plants Hybridized with Solar Heat and Thermal Storage. 44th Annual Stanford Geothermal Workshop, 2019

S. Vera, C. Pinto, P. Tabares-Velasco, G. Molina, G. Flamant, W. Bustamante, A. Pianella, and N. Kincaid. Analysis and comparison of two vegetative roof heat and mass transfer models in three different climates. Energy and Buildings, 2019

N. Kincaid, G. Mungas, N. Kramer, M. Wagner, and G. Zhu. A Performance Comparison of Three Concentrating Solar Power Collector Designs in Linear Fresnel, Parabolic Trough, and Power Tower. Applied Energy, 2018

Q. Ding, S. Barna, K. Jacobs, A. Choubal, G. Mensing, Z. Zhang, K. Yamada, N.Kincaid, G. Zhu, R. Tirawat, T. Wendelin, L. Guo, P. Ferreira, and K. Toussaint. Feasibility Analysis of Nanostructured Planar Focusing Collectors for Concentrating Solar Power Applications. ACS Applied Energy Materials, 2018

Presentations

N. Kincaid, A. Newale, and P. Pepiot. DRGEP Autoencoders: physics-based datadriven low-dimensional manifolds for capturing complex chemistry. Presentation at the 13th U.S. National Combustion Meeting, 2023

A. Bellemans, N. Kincaid, N. Deak, P. Pepiot, and F. Bisetti. P-DRGEP: a novel methodology for the reduction of kinetics mechanisms for plasma-assisted combustion applications. Presentation at the 38th International Symposium on Combustion, 2020

N. Kincaid, A. Newale, and P. Pepiot. Investigation of principal component methodologies to capture low-

temperature chemistry in LES-PDF. Presentation at the 12th U.S. National Combustion Meeting, 2020

N. Kincaid, G. Zhu, G. Mungas, N. Kramer. Sensitivity Analysis of Optical Performance on a Novel Linear Fresnel Concentrating Solar Power Collector, Presentation at SolarPACES, 2018

N. Kincaid, P. Tabares. A Green Roof Heat and Mass Transfer Model Coupled with a Finite Difference Method for Building Energy Simulations, Poster Session at the Graduate Research and Discovery Symposium. Colorado School of Mines, 2017.