TAYLOR L. JOHNSON

Website: taylorlynnejohnson.github.io

EDUCATION

University of Florida, Wertheim College of Engineering — Gainesville, FL
Bachelor of Science in Mechanical Engineering — May 2025
Honors Thesis: Materials Exploration for Sulfur Chemical Looping
GPA: 3.97/4.0

PUBLICATIONS

D. McCord, E. Gager, X. Wang, **T. Johnson**, J. Beachy, S. Phillpot, J. C. Nino, A. McDaniel, J. Scheffe, "Solar Thermochemical Redox Cycling Using Ga- and Al- Doped LSM Perovskites for Renewable Hydrogen Production" *Journal of Physical Chemistry C* DOI: 10.1021/acs.jpcc.4c02797

L. Al-Ghussain, **T. Johnson**, J. Martinek, Z. Ma, "Techno-economic Feasibility Analysis of Solar Industrial Process Heat with Solid Particle Thermal Energy Storage System" *Published as proceedings of the 18th International Conference on Energy Sustainability*, in preparation for submission to *Journal of Solar Energy Engineering*

T. Johnson, L. Mclaughlin, "Optimization and Techno-economic Analysis of a Hybrid PV-CSP System with Thermal Energy Storage and sCO2 Brayton Cycle" Manuscript in preparation for submission to *Journal of Solar Energy*

AWARDS

- **American Society of Mechanical Engineers (ASME) Outstanding Paper Award** - Awarded to "Techno-economic Feasibility Analysis of Solar Industrial Process Heat with Solid Particle Thermal Energy Storage System" at the 18$^{\text{th}}$ International Conference for Energy Sustainability in Anaheim, California **(1 of 3 out of 286 papers)**
- **Consultative Group on International Agricultural Research Assistantship** - Awarded to develop a tool for crop disease risk assessment to help countries create strategies for invasive pest and disease management, which has been applied to assess the impact of climate change on Chilean Needle Grass migration in New Zealand

RESEARCH EXPERIENCE

Sandia National Laboratories National Solar Thermal Test Facility — Albuquerque, NM
Thermal Sciences R&D Intern — June 2023 – Present

- Developing a techno-economic model for world's first large-scale particle TES system for CSP, the Gen 3 Particle Pilot Plant (G3P3)
- Designing, modeling, and testing a radial packed bed thermal energy system using photovoltaics for charging to provide heat to a greenhouse for the Mi'kmaq tribe of northern Maine, which will be used as a case study to support commercial application
- Modeled a startup's photovoltaic (PV)-concentrated solar (CSP)-thermal energy storage (TES) system in Python to inform optimal prototype design and function, followed by a geographic analysis to identify deployment sites. Documented the findings as first author of a manuscript in preparation for submission to the Journal of Solar Energy
- Designed a target and managed logistics for an experiment assessing the performance of a novel mechanically-coupled twisting heliostat, creating a CAD model of the solar field to determine heliostat placement and alignment with the experimental target
- Conducted thermal and stress analyses of an intermediate storage tank for the G3P3 project using Ansys

National Renewable Energy Laboratory Thermal Sciences Group — Golden, CO
SULI Thermal Sciences R&D Intern — Jan – Aug 2023

- Developed a techno-economic feasibility analysis of a hybrid photovoltaic (PV) and concentrated solar power (CSP) system integrated with particle-based thermal energy storage (TES) for industrial process heat applications
- Modeled annual performance of CSP and PV systems in Python, determined optimal sizes for system components, devised energy dispatch strategy, and developed logic to minimize levelized cost of heating (LCOH) of various configurations of PV, CSP, and TES. Performed a case study demonstrating the potential of the system to provide a continuous heat supply for less than 3 cents/kWh$_{th}$ to the Sears Valley Mining Facility, one of California's largest CO2 emitters
- Analyzed and discussed results of the model in a conference paper and presented these results at the 18$^{\text{th}}$ International Conference on Energy Sustainability. Running additional analyses to prepare submission to *Journal of Solar Energy Engineering*

University of Florida Renewable Energy Conversion Laboratory Gainesville, FL
Research Assistant May 2021 – Present

- Collaborating with a renewable hydrogen startup on hydrogen production via sulfur chemical looping. Using thermodynamic modeling and machine learning to identify redox materials, tested via TGA and solar furnace experiments
- Collected efficiency data on an external concentrating parabolic collector (XCPC) system over a series of months to train a machine learning algorithm that integrates with a techno-economic model to predict performance and cost based on geographic data
- Programmed an interactive database to explore candidate redox materials for solar thermochemical water-splitting and performed TGA experiments on non-stoichiometric perovskite materials which helped identify LSMG6482 as a highly promising redox material

Massachusetts Institute of Technology Electrochemical Energy Laboratory Cambridge, MA
Research Assistant Oct 2023 – May 2024

- Researched solid-state superionic conductors to enhance Li-ion battery performance, utilizing Crystal Graph Convolutional Neural Networks (CGCNNs) to predict site-to-site transport properties and identify materials with fast ionic conduction capabilities
- Processed, cleaned, and analyzed large datasets, adapted machine learning models to extract features from density of states data for bond valence prediction, and developed mathematical representations of atomic-scale properties in crystal structures

PROFESSIONAL EXPERIENCE

Duke Energy Regulated & Renewable Energy Program Tampa, FL
Mechanical Engineering Intern May – Aug 2022

- Analyzed operational data to diagnose and redesign malfunctioning control and position valves on the heat recovery steam generator (HRSG) of a combined cycle power plant
- Conducted thermodynamic and heat transfer modeling in Ansys to measure the performance and longevity of heat exchangers

TEACHING EXPERIENCE

University of Florida Mechanical & Aerospace Engineering Gainesville, FL; Almeria, Spain
Teaching Assistant—Heat Transfer, Fluid Mechanics, Thermodynamics, Solidworks May 2021 – Present

- Served as a teaching assistant for courses in thermodynamics, fluid mechanics, heat transfer, and computer-aided design, including a study abroad course in Almeria, Spain, focused on applying thermodynamics to solar power generation and industrial decarbonization taught by Drs. Jonathan Scheffe and Aldo Steinfeld
- Conducted reviews, held office hours, and graded assignments and exams for 520 students across 6 semesters
- Developed questions and solutions for a Python-based Thermodynamics textbook

LEADERSHIP EXPERIENCE

Engineers Without Borders Peru Gainesville, FL; Maras, Peru
Design Lead Aug 2021 – Aug 2024

- Prepared proposals, grant applications, and assessment reports for various projects addressing water scarcity in Peru's Sacred Valley region, including a 7,663 ft^3 irrigation reservoir which will support local farmers by enabling irrigation across 50 acres of farmland
- Led the assessment and design phase for a project to provide running water to the region's only medical clinic, coordinating a team of 15 student engineers through weekly meetings to assign tasks and guide research and design efforts. Traveled to Maras, Peru, to evaluate the condition of past projects, gather data, and collaborate with stakeholders on future plans

CONFERENCE PRESENTATIONS

- "Techno-economic Feasibility Analysis of Solar Industrial Process Heat with Solid Particle Thermal Energy Storage System." *18^{th} International Conference on Energy Sustainability*, July 2024, Anaheim, CA.

POSTER PRESENTATIONS

- "Optimization of a Hybrid PV-CSP System with Particle TES and sCO_2 Brayton Cycle." *HelioCon*, August 2024.
- "Optimization of a Hybrid PV-CSP System with Particle TES and sCO_2 Brayton Cycle." *Sandia National Laboratories Research Symposium*, August 2024, Albuquerque, NM.
- "Techno-economic Feasibility Analysis of Solar Industrial Process Heat with Solid Particle Thermal Energy Storage System." *National Renewable Energy Laboratories Research Symposium*, August 2023, Golden, CO.