JUDD LARSON, P.E., PH.D.

ENVIRONMENTAL/CHEMICAL ENGINEER
SUSTAINABILITY EXPERT

352-871-4722 | juddlarson@gmail.com | Fuquay-Varina, NC | PE# 13090

PROFILE SUMMARY

Professional engineer with 17 years of experience in the environmental field working as an engineer, scientist, researcher, innovator, and instructor:

- Expertise in solid & hazardous waste management, water and wastewater treatment, anaerobic digestion & waste valorization, composting, landfill design & engineering, life cycle assessment (LCA), PFAS and emerging contaminants, experimental design and statistical methods, and conducting laboratory & field studies
- Over 12 years of laboratory experience on solid waste management and water treatment projects with goals of cost reduction, waste valorization, pollution prevention, and protecting public health
- Over a decade managing research and teaching labs
- Six years in STEM education teaching three upper divisional courses to nearly 300 chemical engineering students that included heat and mass transfer, process control, thermodynamics, laboratory components, technical writing, design of experiments, modeling and applied and statistical theory
- Experienced in project management, task leadership, and business development
- Co-led the innovation and development of RTI Aquantix, a solution for remote monitoring of point-of-use water filters in large buildings and campuses, currently deployed throughout the Denver International Airport
- Other significant experience in storm water design, water quality analyses, hydraulic modeling, sanitary sewer inflow and infiltration studies, potable water treatment, pipeline design, and construction, trenchless technologies, air quality analyses, air pollution control, and groundwater remediation

EXPERIENCE

Environmental & Chemical Research Engineer
RTI International

Sept. 2021 – Current

Member of the *Center for Environmental Health, Risk, and Sustainability* contributing to expertise in desk and laboratory studies in sustainable waste management, carbon capture, pollution prevention & control, and remediation.

- Currently leading several **cost-cutting fractional factorial experimental designs** to test the resource use of food waste (FW) sink disposers and kitchen counter-top FW composters. These data will be used to build general linear models for predicting water and

EDUCATION

Ph.D. Chemical Engineering, University of Wyoming

M.E. Environmental Engineering Sciences, University of Florida

B.S. Environmental Engineering Sciences, University of Florida

TECHNICAL SKILLS

Microsoft Office (Word, PowerPoint, Excel, Access, Outlook); Life Cycle Assessment (OpenLCA, MSW-DST), technical writing, Visual Basic programming and macro development; LabView, AutoCAD, JMP, R, SPSS, HELP modeling, computational methods, course design & classroom instruction, well versed in laboratory analyses, QA/QC, equipment care, field studies & sampling, as well as chemical & biological safety

ENGINEERING & MANAGEMENT SKILLS

Project Management & Task Leadership
Research Article & Report Writing
Proposal & Grant Writing
Project Drawings & Specifications Preparation
Administration & Budgeting
Building Relationships/Partnerships
Diverse Audience Communication
Mentorship & Managing Teams
Public Speaking & Outreach
Quality Assurance Project Plan (QAPP) Preparation
Excellent Organizational Skills
Experience with Govt Agencies & Private Clients

RESEARCH SKILLS

Methodological Skills
Experimental Design, Factorial and Fractional Factorial Design, Field Studies & Sampling

energy use for each device type. Lab end-product testing will inform LCAs of several end-of-life FW management scenarios.

- Also, currently leading 2 FW field studies on depackagers & digesters
- Managed and led four fully parametrized **ISO 14040/14044 LCA studies** using OpenLCA informed by a combination of process modeling, laboratory experiments, and client information for both government (DOE) and private clients
- Participated in three **PFAS contamination and treatment** EPA projects resulting in two peer-reviewed publications
- Developed a **general linear model using R** to predict recycling rates at the country-level across the globe, predicting MSW recycling rates of 65 countries within +/-5%, 12 within +/-1%, and 4 predicted exactly
- Led two in-depth EPA reports identifying C&D **technologies and factors impacting waste reduction, recovery, and recycling**
- Advised three EPA projects updating features and functions of the **hydrologic evaluation of landfill performance (HELP) model**
- Served on three federal **EPA grant review panels** to evaluate and rank grant applications for awards

Adjunct Professor
University of Wyoming, Chemical Engineering Department
2014 – 2020

Developed & Taught: Multicomponent Thermodynamics, Unit Operations 1, Unit Operations 2. Guest lectured for Chemical Process Analysis, Thermodynamics I, Process Dynamics and Control, Environment, Technology and Society, Solid Waste Engineering

Independent Environmental Consultant
Various Clients
2012 – 2021

Expert technical reviewer to assess content and scope, apparent validity of analytical techniques, and soundness of conclusions

Project Engineer
Innovative Waste Consulting Services (IWCS)
2010 – 2012

Supported several solid waste-related projects in the field – researching, writing reports, and providing engineering drawings and calculations

Senior Engineer
Western Research Institute (WRI)
2010 – 2011

Provided project management and hands-on lab support for environmental studies and lab experiments.

- Aided in testing a novel biological carbon capture process using chemolithoautotrophs

Project Engineer
CDM-Smith
2007– 2010

Supported environmental and civil engineering projects in the field, including researching and writing reports and providing engineering drawings and calculations.

- Worked on ten water & wastewater treatment and conveyance projects including process piping, controls, and tank designs
- Aided in five solid waste projects that included HELP model simulations, fill plans, air-space studies, and bottom liner designs
- Conducted four stormwater conveyance and treatment projects

Laboratory Skills

GC, HPLC, MS, TC, TOC, COD, BOD, BMP, FRET, pH, Spectrophotometry, Fluorometry, Protein Assays, TS, VS, MC, Microbial Culture, Aseptic Methods, Anaerobic Techniques, Chemostat Creation & Operation, DNA Extraction and prep for sequencing, BLAST analyses

Analytical Skills

Inferential Statistics, ANOVA, Linear and Nonlinear Regression Methods – Indicator-Variable Regression, Mixed-Variable Regression, General Linear Models, Bioenergetics Analyses, Thermodynamics Analyses

AWARDS & RECOGNITION

RTI Rise Award
RTI Spark Enterprise Award
Environment Research and Education Foundation (EREF) Scholar
University of Wyoming Faculty Aid Grant
CDM Quick Hit 2007
University of Florida Undergraduate Research Scholar
ASME Solid Waste Processing Scholarship 2005
Graduated Summa Cum Laude 2004

REFERENCES

David Bagley, P.E., Ph.D.
(former advisor)
Chemical and Biomedical Engineering Department
University of Wyoming
bagley@uwyo.edu

Riley Mulhern, Ph.D.
(former RTI co-worker)
Department of Environmental Studies
University of Colorado Boulder
riley.mulhern@colorado.edu

Ben Reinicke, EIT
(former student)
TDA Research
breinick1@gmail.com

Timothy Townsend, P.E., Ph.D.
(former advisor)
Department of Environmental Engineering Sciences
University of Florida
ttown@ufl.edu

CURRICULUM VITAE

Address: 6500 Berry Meadow Ct. Fuquay-Varina, NC, 27526
Phone: (352) 871-4722
Email: juddlarson@gmail.com

Education

2020 PhD, Chemical Engineering, University of Wyoming, Laramie, Wyoming. (with a minor in Environment and Natural Resources)

2006 ME, Environmental Engineering, University of Florida, Gainesville, Florida.

2004 BS (*Summa Cum Laude)*, Environmental Engineering, University of Florida, Gainesville, Florida.

Licensure

Wyoming Licensed Professional Engineer (PE# 13090)

Professional Experience

2021 to date. RTI International, Research Triangle Park, NC.

Environmental and Chemical Research Engineer. Member of the Center for Environmental Health, Risk, and Sustainability contributing to expertise in desk and laboratory studies in sustainable waste management, carbon capture, pollution prevention & control, and remediation.

2014 to 2020. University of Wyoming, Chemical Engineering Department, Laramie, WY

Adjunct Instructor. Developed & taught three upper divisional courses to nearly 300 chemical engineering students that included heat and mass transfer, process control, thermodynamics, laboratory components, technical writing, design of experiments, modeling and applied and statistical theory.

2012 to 2021. Independent Consultant

Expert Technical Reviewer. Reviewed technical reports to assess whether the approaches, data analyses, and presentations were clear and scientifically valid, as well as the results technically sound. Specifically addressed content and scope, apparent validity of analytical techniques, and soundness of conclusions.

2010 to 2012. IWCS

Expert Technical Reviewer. Technically reviewed life cycle assessment methods and calculations.

Project Engineer. Supported several solid waste-related projects in the field and via desk work, including researching and writing reports and providing engineering drawings and calculations.

2010 to 2011. WRI

Senior Engineer. Provided office and hands-on project management and lab support for several environmental studies and experiments, including a novel biological carbon capture process.

2007 to 2010. CDM-Smith

Project Engineer. Supported several environmental and civil engineering projects in the field and via general engineering office work, including researching and writing reports and providing engineering drawings and calculations. These projects included solid waste design and engineering, remediation, chemical fate and transport, stormwater quality and hydraulic modeling, sanitary sewer inflow and infiltration, wastewater and water treatment plant design and engineering, potable water pipeline design, and construction, trenchless technologies, air quality, and environmental life cycle assessments.

RTI Project Experience

Food Waste Preprocessing and Life Cycle Analysis (2024 to date) – *Task Lead*. For the USEPA, Dr. Larson is leading several experimental and analytical efforts to evaluate the resource use of food waste sink disposers and kitchen counter-top composters. He is designing and executing cost-efficient fractional factorial experiments to quantify water and energy consumption, with results informing general linear models for predictive analysis. Along with laboratory testing of end products, these data will support life cycle assessments (LCAs) across various food waste end-of-life food waste management scenarios. Additional task orders include:

- Evaluating commercial aerobic digesters for resource use and end-product quality, comparing their effectiveness to traditional commercial food waste management pathways.
- Assessing depackaging equipment for their resource consumption and potential microplastics generation in separated food waste streams.

Development of a Liquid Addition Feature to the Hydrologic Evaluation of Landfill Performance Model (2024 to date) – *Task Lead.* Dr. Larson is aiding in updating Version 4 of the EPA Hydrologic Evaluation of Landfill Performance (HELP) model with a new liquid addition feature to more accurately model temporal variation in liquid addition and leachate recirculation in landfills.

Life Cycle Assessment of a Novel Cement Plant Carbon Capture Process (2023 to date) – *Research Environmental Engineer.* For a national cement manufacturer, Dr. Larson is conducting an LCA study to evaluate the environmental impacts of a novel non-aqueous solvent carbon capture process under a Department of Energy grant using the TRACI 2.1 impact assessment method. This fully parametrized ISO 14040/14044 LCA includes modeling of infrastructure, absorbent synthesis, and plant operations using several different power scenarios, including use of alternative fuels, as well as a sensitivity analysis.

RTI Aquantix (2022 to date) – *Lead Innovator*. Working with RTI's Technology Ventures team, Dr. Larson developed a solution for remote monitoring of point-of-use water filters in large buildings and campuses. Dr. Larson helped lead internal strategy and external business development to launch the product for commercial use and helped develop a new business line for RTI. Website: https://www.rtiaquantix.com/. It is currently deployed throughout the Denver International Airport after a successful pilot trial.

Life Cycle Assessment of a Novel Direct Air Capture Process (2024) – *Research Environmental Engineer.* Dr. Larson conducted an LCA study using OpenLCA software to evaluate the environmental impacts of a novel direct air capture (DAC) carbon capture and sequestration (CCS) process under a Department of Energy grant using the TRACI 2.1 impact assessment method. This fully parametrized ISO 14040/14044 LCA included lab testing to inform modeling of infrastructure, sorbent synthesis, and plant operations using eight different powered scenarios and included a sensitivity analysis.

Clean Ports, EPA Competitive Grant Program (2024) – *Project Engineer.* For the Clean Ports (CP) program, Dr. Larson, aided the USEPA in merit review and scoring of grant applications per the provided Notice of Funding (NOFO) documentation. In addition, Dr. Larson will also be a part of the review board panel to evaluate and rank reviewed grants.

CPRG, EPA Competitive Grant Program (2024) – *Project Engineer.* For the Climate Reduction Grant (CPRG) program, Dr. Larson, aided the USEPA in review and scoring of grant applications for technical quality per the provided Notice of Funding (NOFO) documentation. In addition, Dr. Larson was also a part of the review board panel to evaluate and rank reviewed grants.

DERA, EPA Competitive Grant Program (2023 to 2024)**—***Project Engineer*. For the USEPA, Dr. Larson reviewed Diesel Exhaust Reduction Act (DERA) grant applications, conducting evaluations of technical and merit-based eligibility using Notice of Funding Opportunity (NOFO) documentation. Further, Dr. Larson participated in merit review boards to evaluate and rank submitted grants for regional DERA funding.

Life Cycle Assessment of Medical Devices (2023 to 2024)— *Research Environmental Engineer.* For a worldwide medical devices manufacturer, Dr. Larson conducted an LCA study to compare environmental impacts using TRACI 2.1 impact assessment for scenarios involving the manufacture and end-of-life management of medical devices and their packaging, including recycling, reprocessing, single-use, and hybrid scenarios in the US and Europe using the EcoInvent 3.9.1 and USLCI Commons databases via the OpenLCA software.

Examination of Medical Waste Management Around the World (2022 to 2023)—*Research Environmental Engineer*. At RTI, for a global medical device company, Dr. Larson researched the state of practice of medical waste management to aid in better understanding the global medical waste management landscape and improve sustainability in the sector.

Assessment of Global Recycling Rates (2022 to 2023) — *Research Environmental Engineer*. Dr. Larson created a general linear model using R to predict recycling rates for different countries across the globe, for a worldwide medical devices manufacturer. This model was able to predict MSW recycling rates for 65 countries within +/-5%, 12 within +/-1%, and 4 were predicted exactly.

PFAS Evaluation of NPDES Permits (2023) – *Research Environmental Engineer*. For the USEPA, Dr. Larson conducted an analysis of nationwide NPDES permit effluent limits for PFAS.

PFAS Fate and Transport in MSW Management (2022 to 2024) — *Research Environmental Engineer*. For the USEPA ORD, Dr. Larson amassed information and determined key data gaps aiding in updating the EPA's information and guidance to the public on the sources, fate, transport, and treatment of PFAS in landfills and thermal treatment devices.

State of Practice of PFAS Thermal Treatment (2022 to 2024)—*Research Environmental Engineer*. Along with the U.S. Environmental Protection Agency (EPA) Office of Research and Development (ORD), RTI and Dr. Larson are working to update EPA's Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances to better inform stakeholders of the state of practice of PFAS Thermal Treatment, PFAS sources, analytical methods, emissions, and treatment technologies.

Opportunities for Technology-Enabled Construction and Demolition Debris Reduction, Recovery and Recycling (2021 to 2023)—*Research Environmental Engineer.* At RTI, for the U.S. Environmental Protection Agency (EPA) Office of Research and Development (ORD), Dr. Larson aided in the examination of emerging construction and demolition (C&D) debris management technologies to increase materials reduction, recovery, and recycling and to minimize disposal.

Examination of Factors Influencing the Reduction and Recovery of Waste from Construction Projects (2021 to 2024)—*Task Lead*. At RTI, for the U.S. EPA ORD, Dr. Larson is researching efficient and cost-effective methods for storing and distributing building materials to reduce the amount of C&D waste landfilled and the key factors that influence the elimination, reduction, and recovery of C&D waste from construction sector activities.

Update to the Hydrologic Evaluation of Landfill Performance Model (2021 to 2023)—*Project Engineer.* Dr. Larson provided guidance on the precision of Version 4 of the EPA Hydrologic Evaluation of Landfill Performance (HELP) model inputs & outputs and tested new model functions.

Clean Water for Carolina Kids Program (2021 to date)—*Research Environmental Engineer*. Supports mitigation planning of water lead contamination within North Carolina public schools and childcare facilities.

RFI (DE-FOA-0002682) Response to US Dept. of Energy, Office of Energy Efficiency and Renewable Energy Bioenergy Technology Office (BETO) on Community-Scale Resource and Energy Recovery from Waste Solutions (2022) – *Research Environmental Engineer.* For BETO, Dr. Larson provided input on problems communities face dealing with organic wastes, priority organic wastes, different organics waste management options, as well as their environmental and social impacts.

Municipal Solid Waste Decision Support Tool (2021)—*Research Environmental Engineer.* Provided clients with a better understanding of the costs and environmental impacts of their waste systems using a computer-based Municipal Solid Waste Decision Support Tool (MSW-DST).

Past Employers Project Experience

Position	**Employer**	**Client**	**Description of Work**
Expert Technical Reviewer	Independent Consultant	Loci Controls via PTP Informatics	Provided an external technical review on a comparative analysis of landfill gas collection wells and an automated landfill gas collection well system installed at US municipal solid waste landfills.
Expert Technical Reviewer	Independent Consultant	Pegasus Technical Services	Provided an external peer review on a 12-month data trend report for the US EPA regarding a landfill subsurface smoldering event at the Bridgeton landfill near St. Louis, Missouri in 2020
Expert Technical Reviewer	Independent Consultant	RTI International	Provided an external peer review on a 12-month data trend report for the US EPA regarding a landfill subsurface smoldering event at the Bridgeton landfill near St. Louis, Missouri in 2015, 2016, 2017, 2018, 2019.
Expert Technical Reviewer	Independent Consultant	RTI International	Provided review and guidance on the Bridgeton Landfill "Neck Heat Extraction System Monthly Report April 2018"
Expert Technical Reviewer	IWCS	CDM-Smith	Reviewed a life cycle assessment of the environmental impacts of landfilling food waste for the Water Environment Research Foundation (WERF), final report, *OWSO5R07e: Sustainable Food Waste Evaluation*

Position	Employer	Client	Description of Work
Project Engineer	IWCS	Landfill Technologies Corp.	Conducted a detailed field audit of a 100+ well landfill gas collection system in San Juan, Puerto Rico that identified specific remedial strategies to improve gas collection through improved operation, capital improvements, and system adjustments
Project Engineer	IWCS	Landfill Technologies Corp.	Developed an integrated landfill leachate seepage management system at an unlined Subtitle D landfill in Hormigueros, Puerto Rico, including leachate production analysis and hydraulic analysis
Project Engineer	IWCS	Landfill Technologies Corp.	Evaluation of leachate production rates for the new operational development phase at a municipal landfill located in Cabo Rojo, Puerto Rico using the hydrologic evaluation of landfill performance (HELP) model
Senior Engineer	WRI	DOE	Aided in project management and experimental setup for the development of a novel biological carbon capture to vehicle fuel conversion process using chemolithoautotrophic bacteria for fossil fuel-fired power plants.
Project Engineer	CDM-Smith	Various Clients	Developed a full landfill system design for an ash monofill at Camp Bastion/Camp Leatherneck in Afghanistan, including contract drawings, HELP model analysis, leachate collection system design, and final cap design Developed permit calculations and contract drawings for the Delaware Solid Waste Authority Aided in the development of a life cycle analysis comparing multiple methods for the management of food waste for a confidential client Developed a health and safety plan for the shredding of MSW prior to landfilling

Position	Employer	Client	Description of Work
			Performed Hydrologic Evaluation of Landfill Performance (HELP) modeling on several landfill projects
			Prepared landfill air space analyses and reports
Project Engineer	CDM-Smith	Various Clients	Performed process engineering work for the Columbus, Ohio Southerly WWTP grit removal and flushing water systems and the Port of Portland airport (PDX) storm water deicing fluid management system
			Conducted sanitary sewer replacement and rehabilitation recommendations to reduce inflow & infiltration
			Performed private inflow and infiltration assessment field work
			Performed process engineering work and cost analysis for a UV system upgrade to a WTP
			Acted as resident project representative for multiple potable water line construction projects
			Calibrated EPA SWMM4 models of city sewer sheds
			Maintained a groundwater pump and treat system
			Conducted stormwater sampling for the city of Columbus, OH
			Prepared AutoCAD drawings and markups for projects related to groundwater well installations, water line installations, solid waste landfill permitting and construction, storm water management, WTP improvements, and WWTP improvements
			Prepared specifications and bid packages and reviewed construction shop drawings for approval on multiple projects

Academic Research

Ph.D, University of Wyoming, Chemical Engineering Department
Laramie, Wyoming

- Designed and conducted laboratory experiments to determine factors affecting cellulose hydrolysis by a methanogenic, cellulolytic consortium: Built and operated a lab-scale anaerobic digester treating the organic fraction of municipal solid waste (OFMSW), built and operated a lab-scale methanogenic cellulolytic enrichment reactor, conducted batch anaerobic digestion microcosm experiments to monitor cellulose hydrolysis, synthesized and extracted autoinducer-2 CLPY reporter protein using Escherichia coli strain BL21 (LuxS−)-pQE30CLPY
- Experience with GC-TCD, GC-FID, HPLC, GC-MS, protein assays, DNA extraction, spectrophotometry, fluorescence resonance energy transfer (FRET), COD analysis, gravity-flow chromatography, pH analysis, sonication, aseptic technique, handling and growing pure and mixed cultures

Master's Degree, University of Florida, Environmental Engineering Sciences Department
Gainesville, Florida

- Conducted bioreactor landfill research including assistance operating a SCADA system at the Polk County North Central Landfill
- Designed and oversaw construction of horizontal leachate injection lines for a bioreactor landfill
- Installed over 100 vibrating wire pressure transducers for monitoring pore water pressure within a bioreactor landfill
- Installed vibrating wire earth pressure cells and settlement monitoring systems to monitor load-settlement relationships at a newly constructed landfill
- Assisted in *in situ* MSW lysimeter experiments to determine the influence of landfilled electronic waste on leachate composition
- Maintained, operated, and managed total organic carbon laboratory analysis
-

Undergraduate Researcher, University Scholars Program, University of Florida
April 2003 – March 2004, Gainesville, Florida

- Conducted fuel cell research, calibrated wet test meters, calibrated rotameters, worked with FTIR spectroscopy to test a novel method for real-time hydrogen gas measurements

SUMMARY OF SCHOLARLY INTERESTS

Research Interests:	Solid and Hazardous Waste Management, Wastewater Treatment, Anaerobic Digestion, Life Cycle Assessment/Environmental Product Declarations, Composting, Waste-to-Energy, Biological Waste Treatment, Landfill Design, Landfill Waste Diversion, Thermal Treatment, Material Recovery & Reuse, Material and Nutrient Recycling, Emerging Contaminants and Treatment (PFAS, microplastics, etc.), Point-of-Use & Point-of-Entry Water Treatment, Decentralized Water Treatment, Pollution Prevention, Extended Producer Responsibility, Circular Economy, Biogas Cleanup and Beneficial Use, Remediation, Chemical Fate and Transport, Plastic Pollution Mitigation, Environmental Policy, Air Pollution, Internet-of-Things Environmental Applications

Teaching Interests:	Engineering Fundamentals (e.g., Statics, Dynamics, Thermodynamics, Fluids), Process Analysis, Unit Operations, Experimental Design and Statistics, Solid and Hazardous Waste Management, Wastewater Treatment, Water Treatment, Water Chemistry, Chemical Fate and Transport
Outreach Interests:	Public engagement and discussions about solid waste issues and sustainability in general, environmental awareness and stewardship for K-12 students, professional development for young engineers and scientists

Publications

Larson, JA (2006). *"Investigations at a bioreactor landfill to aid in the operation and design of horizontal injection liquids addition systems"* Master Thesis. Environmental Engineering Sciences Department. University of Florida

Larson, JA et al. (2012). *"A Field Study to Estimate the Vertical Gas Diffusivity and Permeability of Compacted MSW using a Barometric Pumping Analytical Model"* Waste Management & Research*, 30(3), p276-284*

Larson, JA. (2020). *"Factors Affecting the Rate of Anaerobic Cellulose Biodegradation by a Methanogenic Cellulolytic Enrichment Consortium Sourced from the Organic Fraction of Municipal Solid Waste"* PhD Dissertation. Chemical Engineering Department. University of Wyoming.

Larson, J.A. and Bagley, D.M. (2022). *"Sessile and planktonic microbial taxonomy of a methanogenic cellulolytic enrichment reactor sourced from the organic fraction of municipal solid waste"*. Journal of Environmental Engineering (ASCE). 148(4): 04022004.

Tolaymat, T., Robey, N., Krause, M., Larson, J., Weitz, K., Parvathikar, S., ... & Krug, J. (2023). "*A critical review of perfluoroalkyl and polyfluoroalkyl substances (PFAS) landfill disposal in the United States"*. Science of The Total Environment, 167185.

Weitz, K., Kantner, D., Kessler, A., Key, H., Larson, J., Bodnar, W., ... & Phelps, L. (2024). *"Review of per-and poly-fluoroalkyl treatment in combustion-based thermal waste systems in the United States*". Science of The Total Environment, 172658.

In progress: "Life cycle assessment of a cement plant carbon capture and sequestration system and other greenhouse gas emission reduction practices in the United States"

In progress: "Detection and quantification of autoinducer-2 (AI-2) in defined and undefined media cultures"

In progress: "Effects of substrate and inoculum concentrations on the kinetics and growth of sessile and planktonic biomass during the anaerobic biodegradation of cellulose by an OFMSW leachate-derived methanogenic consortium"

Teaching

Year	Semester	Course No./Title	Cr. Hrs.	Enrollment
2020	Spring	CHE4050/Unit Operations 2*	3	31
2019	Fall	CHE3040/Unit Operations 1	3	31
2019	Spring	CHE4050/Unit Operations 2	3	36
2018	Fall	CHE3040/Unit Operations 1	3	37
2018	Spring	CHE4050/Unit Operations 2	3	41
2017	Fall	CHE3040/Unit Operations 1	3	41
2015	Fall	CHE3015/Multicomponent Thermo	3	35
2015	Spring	CHE3015/Multicomponent Thermo	3	8
2014	Fall	CHE3015/Multicomponent Thermo	3	11

*Converted to asynchronous virtual instruction during COVID-19 pandemic

Course Descriptions:
CHE/PETE 3015 Multicomponent Thermodynamics. Introduces mixture properties, such as chemical potentials, excess properties, partial molar properties, heats of mixing, fugacities, and practical tools for estimating them from solution theories, equations of state, and use of the thermodynamic web. These tools and concepts are applied to phase and chemical equilibria.

CHE3040 Unit Operations 1. First course of a two-course sequence (CHE 3040-CHE 4050) that applies the principles of key unit operations through experimentation. CHE 3040 examines settling, pump performance, heat transfer, adsorption, gas transfer, and distillation. Additionally, CHE 3040 introduces key topics in statistics including: probability distributions, data set central tendency (mean, median, mode), data set dispersion (variance and standard deviation), systematic and random error, confidence intervals, and inferential statistical techniques such as t-tests, F-tests and ANOVA. These topics are applied in homework and laboratory experiment analyses with real data. Finally, CHE 3040 emphasizes the preparation of formal, clearly written engineering laboratory reports that include experimental error analysis.

CHE4050 Unit Operations 2. Second course of a two-course sequence (CHE 3040-CHE 4050) that applies the principles of key unit operations through experimentation. In CHE 4050, students conduct additional experiments examining heat transfer and process control. Additionally, CHE 4050 requires students to design, conduct and analyze 'open-ended' experiments on a topic of their interest, with a goal of developing new laboratories for future students. CHE 4050 also introduces LabView and covers the following topics in experimental statistics: factorial and fractional factorial experimental designs, linear least squares regression, general linear models, and non-linear least squares regression. These topics are applied in homework and laboratory experiment analyses with real data. Finally, CHE 4050 emphasizes the preparation of a formal, clearly written report describing all aspects of the 'open-ended' experiments, including experimental design and error analysis.

Guest Lectures:
CHE2005 Chemical Process Analysis, ES2310 Thermodynamics I, CHE4090 Process Dynamics and Control, CHE4000 Environment, Technology and Society, CE4440 Solid Waste Engineering

Presentations and Proceedings

Larson, J. A. (2019, November). *Anaerobic hydrolysis of cellulose by a methanogenic microbial consortium*. University of Wyoming Chemical Engineering Department Seminar, Laramie, WY.

Larson, J. A., & Bagley, D.M. (2018, February). *Quorum sensing in anaerobic digestion*. 2018 Global Waste Management Symposium, Indian Wells, CA.

Larson, J. A., & Townsend, T. (2005, February). *Performance of horizontal injection lines for moisture addition at a bioreactor landfill*. Florida Department of Environmental Protection. Cocoa Beach, FL.

Larson, J. A. (2004, Apr). *A novel method for detecting and quantifying hydrogen*. 5th Annual University Scholars Symposium. Gainesville, FL.

Technical Reports

USDOE. (2025). Carbon Capture Plant FEED Study for Cement Manufacturing LCA Report. DE-FOA-0002515. FE0032220. National Energy Technology Laboratory

USDOE. (2024). RTI's Direct Air Capture System LCA Report. DE-FOA-0002402. FE0032099. National Energy Technology Laboratory

USEPA. (2024). *Examination of Factors Influencing the Reduction and Recovery of Waste from Construction and Demolition Projects: Circular Economy Opportunities.* Office of Research and Development: Contributor

USEPA. (2023). *Opportunities for Technology-Enabled Construction and Demolition Debris Reduction, Recovery and Recycling*. Office of Research and Development: Contributor

Patents

Network-Connected Decentralized Water Treatment Monitoring System and Operation and Maintenance Tracker (2023). PCT Application No. **PCT/US2023/083785**

Service

- Examined new processing and production methods and uses for rare earth metals and assisted in the procurement of engineering services for the Wyoming State Legislature and University of Wyoming
- Developed Accreditation Board for Engineering and Technology (ABET) assessment measures, conducted assessments, and aided in writing Self-Study reports for the University of Wyoming Chemical Engineering Department accreditation
- Created new prepared laboratory experiments for University of Wyoming chemical engineering undergrad students to demonstrate key unit operations principles
- Made several process and safety improvements to the University of Wyoming Chemical Engineering Department Unit Operations Lab, including designing, testing, and implementing a nitrogen blanket system for the distillation tower lab
- Research Experience for Undergraduate (REU) advisor 2015
- Fundraising Chair for Engineers Without Borders, USA, Central Ohio Professional Chapter, October 2007 – 2008

Awards, Grants, and Scholarships

RTI Rise Award
RTI Spark Enterprise Award
Environment Research and Education Foundation (EREF) Scholar
University of Wyoming Faculty Aid Grant
CDM Quick Hit 2007

University of Florida Undergraduate Research Scholar
ASME Solid Waste Processing Scholarship 2005
Graduated Summa Cum Laude 2004 (Thesis on Use of Decision Matrices)
Elected to the Golden Key International Honor Society
University of Florida Anderson Scholar
Florida Environmental Scholarship 2004
UF General Scholarship
Anderson Scholarship
Manatee County Scholarship
Dean's List
Florida Medallion Scholars Award
Bright Futures Scholarship

Skills

Microsoft Office (Word, PowerPoint, Excel, Access, Outlook); Life Cycle Assessment (OpenLCA, MSW-DST), project management, proposal & grant writing, grant review, Visual Basic programming and macro development; AutoCAD, JMP, R, SPSS, statistical methods, experimental design, computational methods, classroom instruction, laboratory equipment and chemical safety, technical writing