GARRETT ROELL

Personal Information

location	Honolulu, HI
email	groell@hawaii.edu
website	garrettroell.com
lab website	lab.garrettroell.com
GitHub	github.com/garrettroell

EDUCATION

Ph.D., Energy, Environmental & Chemical Engineering

Washington University in St. Louis *2017 - 2023*

Advisor: Prof. Yinjie Tang
Dissertation Title: "The Development of Metabolic Models and Machine Learning Methods for Biofuel-Producing Bacteria"

B.S., Biomedical Engineering

Tufts University *2012 - 2016*

Advisor: Prof. David Kaplan
Capstone Title: "Biocompatible Conductive Hydrogels for Use in Actuators"

PRESENT POSITION

University of Hawai'i at Mānoa *2023 - Present*

Assistant Professor, Department of Molecular Biosciences and Bioengineering
College of Tropical Agriculture and Human Resources

SELECTED HONORS AND AWARDS

University of Hawai'i

Air Force Summer Faculty Fellow 2024
Faculty Research Travel Award 2024

Washington University

Article on the Cover of ACS Synthetic Biology 2023
EECE Graduate Student Travel Award 2022
DOE Office of Science Graduate Student Research Award 2021
Best 'Social Programming Event' Liberman Award 2020
Bruce Rittman Graduate Fellowship

Tufts University

Magna Cum Laude Honors
Dean's List All Semesters

RESEARCH EXPERIENCE

Washington University

Graduate Student Researcher *2018 - 2023*

Multi-omic analysis of aromatic tolerant biofuel producer *Rhodococcus opacus*
Machine learning and kinetic modeling of syngas-consuming *Clostridium species*

Advised by Prof. Yinjie Tang · Tang Research Group

Lawrence Berkeley National Lab

DOE Graduate Fellow *2021 - 2022*

Development of a genome scale model for *R. opacus*
Integration of transcriptomics into the genome-scale model

Advised by Dr. Héctor García Martín · García Martín Research Group

Tufts University

Undergraduate Researcher *2015 - 2016*

Investigated the conductivity and Young's modulus of polymer doped silk gels
Applied findings to optimize displacement of ionic gel actuators for soft robotics

Advised by Prof. David Kaplan · Kaplan Research Group

Tufts University

Undergraduate Researcher *2015 - 2016*

Silk Composite RFID Biosensor for measuring blood glucose levels
Evaluated the sheet resistance and resistivity of a silk-carbon nanotube composites

Advised by Prof. Fio Omenetto · Omenetto Research Group

Tufts University

Undergraduate Researcher *2014*

Silk-Plankton Chimera Proteins for Tissue Engineering
Completed plasmid construction and bacterial transformation for eight cell lines

Advised by Prof. David Kaplan · Kaplan Research Group

Tufts University

Undergraduate Researcher *2013 - 2014*

Immunoaffinity-Based Microfluidics Device for Exosome Isolation
Designed and fabricated a microfluidic device using 3D modeling to detect cancer

Advised by Prof. Qiaobing Xu · Xu Research Group

PROFESSIONAL EXPERIENCE

Washington University

Post-Doctoral Researcher *2023 - present*

Multi-omic analysis of aromatic tolerant biofuel producer *Rhodococcus opacus*
Machine learning and kinetic modeling of syngas-consuming *Clostridium species*

Advised by Prof. Yinjie Tang · Tang Research Group

Genesys Diagnostic Inc

Lab Technician Intern *2013*

Perpared cell lines for karyotyping by fixing samples on microscope slides
Performed Fluorescence In Situ Hybridization (FISH) on cell lines

East Lyme, CT · Genesys Diagnostic Inc

Inspirica Tutors

Professional Tutor *2016 - 2017*

Tutored over 30 students for SAT, ACT, and SSAT
Newton Center, MA

PUBLICATIONS

(6) A Worland, Z Han, …, YJ Tang, WW Su*, **GW Roell***. Elucidation of triacylglycerol catabolism in Yarrowia lipolytica: How cells balance acetyl-CoA and excess reducing equivalents. (2024)
* = corresponding author

(5) Z Xiao, W Li, …, **GW Roell***, Y Chen*, YJ Tang*. Generative artificial intelligence GPT-4 accelerates knowledge mining and machine learning for synthetic biology. ACS Synthetic Biology. (2023)
* = corresponding author

(4) **GW Roell**, C Schenk, …, YJ Tang, HG Martin. A high-quality genome-scale model for *Rhodococcus opacus* metabolism. ACS Synthetic Biology. 12 (2023)

(3) **GW Roell**, A Sathish, N Wan, …, YJ Tang, FS Bao. A comparative evaluation of machine learning algorithms for predicting syngas fermentation outcomes. Biochemical Engineering Journal. 186 (2022)

(2) **GW Roell**, RR Carr, …, M Foston, G Dantas, TS Moon, YJ Tang. A concerted systems biology analysis of phenol metabolism in *Rhodococcus opacus* PD630. Metabolic Engineering, 55 (2019), pp. 120-130

(1) **GW Roell**, J Zha, RR Carr, MAG Koffas, SS Fong, YJ Tang. Engineering microbial consortia by division of labor. Microbial Cell Factories. 18 (2019), pp. 1–11

PUBLICATIONS (In Preparation)

(3) Y Sun, Z Xiao, H Moon, JJ Czajka, R Zhao, Y Chen, YJ Tang*, **GW Roell***. IMPACT: The Industrial Microbiology Publication and AI Crowdsourced Toolbox.
* = corresponding author

(2) K Eckhoff, **GW Roell**, CA Gonzalez, WF Harper. Optimization of phenolic compound removal via horseradish peroxidase: influence of hydrogen peroxide, propylene glycol, and dissolved oxygen

(1) **GW Roell***, A Ponukumati, RR Carr, YJ Tang, M Foston*. Characterizing growth and metabolism of Rhodococcus opacus PD630 on lignin breakdown products.
* = corresponding author

INVITED TALKS

(7) INBRE Western States RAIN Collaboration Studio, Laramie, WY, May 2024, "Integrating Omics Data and Metabolic Models for Bioprocess Optimization"

(6) National Agriculture and Food Research Organization, Obihiro, Hokkaido, Japan, May 2024, "AI and Machine Learning in Agriculture"

(5) AI-ENGAGE, Singapore, February 2024, "Machine Learning and Metabolic Models for Bioprocess Optimization."

(4) AIChE Annual Meeting, Fall 2022, Phoenix, AZ, November 2022, "A High-Quality Genome-Scale Model for Rhodococcus opacus Metabolism."

(3) AIChE Annual Meeting, Fall 2022, Phoenix, AZ, November 2022, "A comparative evaluation of machine learning algorithms for predicting syngas fermentation outcomes."

(2) Genomic Sciences Program Annual PI Meeting, Winter 2019, Tyson Corner, VA, February 2020, "Characterizing growth and metabolism of Rhodococcus PD630 on real lignin breakdown products."

(1) Genomic Sciences Program Annual PI Meeting, Winter 2019, Tyson Corner, VA, February 2019, "A Concerted Systems Biology Analysis of Aromatic Metabolism in Rhodococcus opacus PD630."

CONTRIBUTED PRESENTATIONS

(5) Society for Industrial Microbiology and Biotechnology Annual Meeting, Summer 2021, Austin, TX, August 2021, "Elucidating aromatic utilization mechanisms in engineered *Rhodococcus opacus* strains for lignin valorization."

(4) Genomic Sciences Program Annual PI Meeting, Winter 2019, Tyson Corner, VA, February 2021, "Elucidating Aromatic Utilization Mechanisms in Engineered Rhodococcus opacus Strains for Lignin Valorization."

(3) Genomic Sciences Program Annual PI Meeting, Winter 2019, Tyson Corner, VA, February 2020, "Expression of Beta-Ketoadipate and Aromatic gene clusters in R. opacus strains adapted to growth on model lignin breakdown products."

(2) Genomic Sciences Program Annual PI Meeting, Winter 2019, Tyson Corner, VA, February 2019, "Systems Engineering of Rhodococcus opacus to Enable Production of Drop-in Fuels from Lignocellulose."

(1) Genomic Sciences Program Annual PI Meeting, Winter 2019, Tyson Corner, VA, February 2019, "Exploring the Hybrid Conversion of Lignin into Biodiesel."

TEACHING EXPERIENCE

University of Hawai'i

Instructor *Fall 2024*

BE 437: Biosystems Unit Operations

University of Hawai'i

Instructor *Spring 2024*

BE 491: Special Topics (AI for Bioprocesses)

University of Hawai'i

Instructor *Spring 2024*

MBBE 610: Molecular Biosciences Graduate Seminar

Washington University

Assistant to Instructor *Spring 2020*

EECE 534: Environmental Nanochemistry

Instructor: Prof. Young-Shin Jun

Washington University

Assistant to Instructor *Spring 2019*

EECE 506 Bioprocess Engineering I: Fundamentals & Applications

Instructor: Prof. Yinjie Tang

Washington University

Assistant to Instructor *Fall 2018*

EECE 101 Introduction to Energy, Environmental and Chemical Engineering

Instructor: Prof. Dan Giammar

STUDENTS SUPERVISED

University of Hawai'i

Jacob White, Masters Student (2024-present)
Alan Gan, Undergraduate Student (2024-present)
Jay Rhymer, High School Student (2024)

Washington University

Hannah Moon, High School Student (2022-2023)
Dahlia Abdulsattar, Undergraduate Student (2019-2021)
Duo Zhang, Master's Student (2019-2021)
Osheen Dabas, Master's Student (2020-2020)
Chun -Yu Choi, Master's Student (2019-2019)

MASTER'S COMMITTEES SERVED ON

University of Hawai'i

Yichen Dou (2024-present)
Julia Yuson (2024-present)
Jessica Marowan (graduated 2024)
Kandria Driskill (graduated 2023)

OTHER INFORMATION

Metrics

Citations: 326

Service

MBBE Department Admissions Committee (2023)
President of the Association of Graduate Engineering Students (2020)
Vice President of the Association of Graduate Engineering Students (2020)
Chief Executive Officer of ImpactDB LLC
Chief Technology Officer and Co-Founder of All Things Analysis LLC
EECE Faculty Search Student Committee Spokesman (2019)
Social Coordinator of Association of Graduate Engineering Students (2018 - 2019)
Tufts Emergency Medical Service (2013 – 2014)
Eagle Scout (2012)

Programming Languages and Libraries	**Python**: Pandas, scikitLearn, PyMC3, COBRApy, Django **JavaScript**: React, Node.js, Vanilla JS, ChakraUI
Interests	football · pickleball · volleyball · travel

October 4, 2024