

Linton Freund, MS.

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<https://github.com/hlfreund> | <https://hlfreund.github.io>

ABOUT

I am a trained bioinformatician with seven years of experience in analyzing a variety of sequence data types. I have worked with iTag (i.e., amplicon) and shotgun metagenome sequence data, and I have also developed workflows in Bash shell and R statistical software that walk users through how to process and analyze their data using bioinformatic tools and statistical analyses, most notably model-based analyses. I am passionate about creating and using an accessible, interdisciplinary approach with bioinformatics and statistics to address important questions about environmental health, public health, and their intersections.

EDUCATION

PhD., Genetics, Genomics, & Bioinformatics

Expected Aug 2024

University of California, Riverside; Riverside, CA

Dissertation Title: The Taxonomic and Functional Microbial Diversity of Sub-Ecosystems within the Harsh Salton Sea

MSc., Biology

May 2019

California State University, Long Beach; Long Beach, CA

Thesis Title: Insights into the Structure and Function of the Gut Metagenome in Cartilaginous Fishes

As., Biology

May 2017

Moorpark College; Moorpark, CA

BA., Psychology

June 2014

University of California, Santa Barbara; Santa Barbara, CA

WORK & RESEARCH EXPERIENCE

Graduate Student Researcher

Aug 2019 – Present

Supervisor: Dr. Emma Aronson

Microbiology & Plant Pathology Department, University of California, Riverside

- Led and designed experiments investigating the Salton Sea microbial community and microbial biogeochemical cycling using a multidisciplinary, collaborative approach.
- Extract and quantify DNA extracts for amplicon and shotgun metagenome sequencing.
- Process and analyze amplicon and shotgun sequencing metagenomic data with bioinformatic tools, custom Bash shell scripts, and custom workflows using R statistical software and RMarkdown.
- Perform statistical analyses on amplicon sequence data, metagenome sequence data, and geochemistry data using R statistical software packages and custom R scripts.

Graduate Student Researcher

Aug 2017 – May 2019

Supervisor: Dr. Renaud Berlemont

Microbiology Department, California State University, Long Beach

- Processed raw (unassembled) metagenome sequence data via bioinformatics tools such as MG-RAST and custom Bash shell scripts.
- Statistically analyzed raw metagenome sequence data via custom R scripts and R packages.
- Investigated microbial, enzymatic polysaccharide deconstruction in the gut of vertebrates.
- Assisted Principal Investigator in writing, editing, and reviewing lab publications such as literature reviews and bioinformatics workflows.

Contract Biologist

Jun 2016 – Jan 2017

Supervisor: Dr. Jana Johnson

The Butterfly Project, Moorpark College

- Captured endangered, gravid foundresses and released pupae in the field.
- Performed and supervised feedings of the endangered butterflies.
- Monitored butterfly oviposition and mapped locations of butterfly eggs.

- Built habitats for larvae, pupae, and butterflies respectively and cared for the foliage included in these habitats.

Student Intern

Feb 2016 – Apr 2016

Supervisor: Dr. Subhash Karkare

Biotechnology Department, Moorpark College

- Prepared cytotoxic T-lymphocyte associate protein 4 samples for troubleshooting the Biotechnology Department's enzyme-linked immunosorbent assay (i.e., ELISA) protocol.
- Developed an ELISA protocol to reduce the time of the ELISA for a Moorpark College Biotechnology Certificate course.
- Researched the purpose and technique behind the ELISA for the associated lesson plan.
- Recorded qualitative analysis of ELISA results to include for the ELISA lesson plan & protocol.

Lead Clinical Research Coordinate

Jun 2014 – Aug 2014

Supervisor: Luna Yojay, PharmD.

LY Pharmacy Inc.

- Supervised and recorded the administration of trial pharmaceuticals, specifically medications that target chronic kidney disease, to dialysis patients participating in our trials.
- Monitored vital signs of patients after the trial pharmaceuticals were administered.
- Met with Clinical Research Associates to update them on the incoming results from our patients.
- Recorded and managed trial data utilizing the electronic data-capture Medidata Rave.

Undergraduate Research Assistant

Sep 2013 – Jun 2014

Supervisor: Dr. F. Gregory Ashby

Psychological and Brain Sciences Department, University of California, Santa Barbara

- Designed and conducted an independent research project that focused on how and when the prefrontal cortex switches between procedural versus declarative learning.
- Collected and organized data from graduate students' respective experiments.
- Observed and assisted graduate students in data analysis of computer-based experiments using MATLAB.
- Supervised computational-based experiments for graduate students that targeted procedural and declarative learning systems in the prefrontal cortex.

TEACHING EXPERIENCE

Teaching Assistant

Jan 2024 – Present

Introduction to Cell and Molecular Biology, BIOL 005A

Supervisor: Dr. David Fronk

Microbiology & Plant Pathology Department, University of California, Riverside

- Reviewed course material with undergraduate students as lectures and as worksheets that were completed in class.
- Worked with fellow teaching assistants, the instructors, and the academic coordinator to create and grade quizzes.

Teaching Assistant

Apr 2021 – June 2021

Introduction to Microbiology Lab, MCBL 121L

Supervisor: Dr. James Borneman

Microbiology & Plant Pathology Department, University of California, Riverside

- Lectured on basic microbiology lab techniques and the science behind them, including DNA extraction, DNA purification, and sequencing library amplification using PCR.
- Reviewed and graded lab exams and laboratory notebooks that students used to record their respective experiments and results.

Teaching Assistant

Feb 2018 – May 2018

Introduction to Evolution and Diversity Lab, BIOL 211L

Supervisor: Lindsay Darjany, MS.

Biology Department, California State University, Long Beach

- Created and presented lectures that covered basic concepts from biology and ecology.
- Led students through in-class lab activities that reinforced the concepts covered in our lab lectures.

PUBLICATIONS

Aronson, E. L., **Freund, H. L.**, and Maltz, M. R. 2023. Microbiology of the Critical Zone. Critical Zone and Ecosystem Dynamics, White, T. and A. Provenzale, Eds. Springer-Verlag. *in press*.

Freund, L. (2023). Amplicon Sequencing Workflow (v1.0.1). Zenodo. <https://doi.org/10.5281/zenodo.8264886>

Biddle, T.A., Yisrael, K., Drover, R., Li, Q., Maltz, M.R., Topacio, T.M., Yu J., Del Castillo, D., Gonzales, D., **Freund, H.L.**, Swenson, M.P., Shapiro, M.L., Botthoff, J.K., Aronson, E., Cocker, D.R. 3rd, Lo D.D. Aerosolized aqueous dust extracts collected near a drying lake trigger acute neutrophilic pulmonary inflammation reminiscent of microbial innate immune ligands. *Sci Total Environ.* 2023 Feb 1;858(Pt 3):159882. doi: 10.1016/j.scitotenv.2022.159882. Epub 2022 Nov 2. PMID: 36334668.

Maltz, M.R.; Carey, C.J; **Freund, H.L.**; Botthoff, J.; Stajich, J.E.; Hart, S.C.; Aarons S.; Aciego, S.; Blakowski, M.; Cullen Dove, N.D.; Barnes, M; Pombubpa N.; Aronson, E. Landscape topography and regional drought alters dust microbiomes in the Sierra Nevada of California. *Frontiers in Microbiology* 2022 13:856454.

Freund H.L., Maltz M.R., Swenson, M.P., Topacio, T.M., Montellano, V.A., Porter, W., Aronson, E. Microbiome interactions and their ecological implications at the Salton Sea. *California Agriculture* 2022 76: 1.

Jackson, D.; Maltz, M.R.; **Freund, H.L.**; Borneman, J.; Aronson, E. Environment and Diet Influence the Bacterial Microbiome of *Ambigolimax valentianus*, an Invasive Slug in California. *Insects* 2021 12: 7.

Nguyen, S. T. C., **Freund, H. L.**, Kasanjian, J., and Berlemont, R. 2018. Function, distribution, and annotation of characterized cellulases, xylanases, and chitinases from CAZy. *Applied Microbiology and Biotechnology* 102: 4.

AWARDS

Dissertation Completion Fellowship Award <i>University of California, Riverside</i> \$20,000	2024
Dr. Mir S. Mulla & Leila Mulla Endowed Scholarship Fund <i>University of California, Riverside, College of Natural Sciences</i> \$12,000	2024
Best Poster Presentation <i>Annual Genetics, Genomics, and Bioinformatics Symposium: "Microbial Function and Diversity in a Hypersaline Lake"</i> \$100	2023
Dean's Fellowship Fund Award <i>University of California, Riverside, College of Natural Sciences</i> \$6,200	2023
NMDC Champion <i>National Microbiome Data Collaborative</i>	2022
Workshop Scholarship <i>University of Washington, Summer Institute of Statistical Genetics</i> \$900	2021
Dr. Janet M Boyce Memorial Endowed Scholarship Fund <i>University of California, Riverside, College of Natural Sciences</i> \$2,000	2021

Best Flash-Talk <i>Annual Genetics, Genomics, and Bioinformatics Symposium: "Investigating the Aeolian Microbiome of the Salton Sea"</i> \$50	2020
Chancellor's Distinguished Fellowship <i>University of California, Riverside, College of Natural Sciences</i>	2019
Dr. Vern Eveland Memorial Award <i>California State University, Long Beach</i> \$2,500	2018
Linda Lee Warren Graham Endowed Scholarship <i>California State University, Long Beach</i> \$2,000	2018

SELECTED PRESENTATIONS

Linton Freund, Caroline Hung, Talyssa Topacio, Dr. Charlie Diamond, Alyson Fresquez, Dr. Tim Lyons, Dr. Emma Aronson. Microbial Function and Diversity in a Hypersaline Lake. Poster presentation, UC Riverside Genetics, Genomics, and Bioinformatics Annual Symposium. October 2023, Riverside, California.

Linton Freund, Caroline Hung, Talyssa Topacio, Dr. Charlie Diamond, Alyson Fresquez, Dr. Tim Lyons, Dr. Emma Aronson. Microbial Function and Diversity in a Hypersaline Lake. Poster presentation, 9th Annual Southern California Microbiome Symposium. September 2023, Riverside, California.

Linton Freund, Talyssa Topacio. The Microbial Connection Between Dust & Health in the Salton Sea. Oral presentation, BREATHE Annual Workshop. May 2022, Riverside, California.

Linton Freund. Microbiome Interactions within the Sub-Ecosystems of an Extreme Environment. Oral presentation, UC Riverside Genetics, Genomics, and Bioinformatics Annual Symposium. October 2022, Riverside, California.

Linton Freund. Investigating the Aeolian Microbiome of the Salton Sea. Flash-talk, UC Riverside Genetics, Genomics, and Bioinformatics Annual Symposium. October 2020, virtual attendance.

SKILLS & TECHNIQUES

Bioinformatics Experience

- Experience using a variety of bioinformatic tools to process and assess the quality of amplicon sequence data and shotgun metagenome sequence data including FastQC, Trimmomatic, Cutadapt, the BBDNA tools suite, and DADA2.
- Experience assembling, binning, and annotating shotgun metagenome data as well as calculating read coverage using MEGAHIT, MetaSPades, MetaQUAST, BWA-mem, metaBAT2, checkM, Prodigal, KOFamScan, and featureCounts.
- Experience creating custom scripts using Bash shell and awk commands to process, filter, and merge large amplicon and shotgun metagenome datasets.
- Experience creating reproducible and accessible workflows that utilize a variety of bioinformatics tools using Rmarkdown and version control on GitHub, with associated releases on Zenodo.

Statistical Analysis and Programming

- Experience using statistical techniques to analyze datasets including modeling-based methods (i.e., linear regressions, generalized linear models), ordination methods (i.e., principal components analysis, principal coordinates analysis, redundancy analysis, canonical correspondence analysis), and multivariate and univariate analysis of variance.
- Experience creating scripts and analytical workflows using R statistical software and Bash shell that guide users through how to analyze sequence data and geochemistry data for any research project.

- Experience managing and analyzing large datasets using Bash shell, R statistical software, and high-performance cloud computing clusters at universities.

Laboratory Skills

- Soil, seawater, and environmental dust sample collections and processing (i.e., vacuum filtration, sieving, etc.) based on the lab's standardized protocols.
- DNA extraction, DNA quantification, DNA purification, and PCR of environmental DNA for various research projects.
- Culturing microorganisms from isolated cultures (liquid and solid) or environmental samples on simple and complex media.

Other Skills

- Teaching basic coding in R statistical software and Bash shell, as well as guiding undergraduates and research scientists through coding and analytical tutorials.
- Experience in using Microsoft Word, Excel, PowerPoint, Slack, Discord, and GitHub.

VOLUNTEER & COMMUNITY SERVICE

Food Not Bombs Riverside Chapter <i>Member</i>	Oct 2023 – Present
Queer Graduate Student Association University of California, Riverside <i>President (2022-2023), Vice President (2021-2022), Member (2020 – Present)</i>	Sep 2021 – Present
UAW 2865 <i>United Auto Workers</i> <i>Member (2023 – Present), Bargaining Team Representative Alternate (2022), Biosciences Departments Organizer (2021 – 2022)</i>	Sep 2021 – Present
Genetics, Genomics, and Bioinformatics Student Association University of California, Riverside <i>Vice President (2022-2023), Vice President (2020-2021), Student Representative Alternate (2019 – 2020)</i>	Oct 2019 – June 2023
Biology Graduate Student Association California State University, Long Beach <i>Board Member (2018-2019)</i>	Aug 2018 – May 2019

REFERENCES

Dr. Emma Aronson

Professor, Microbiology & Plant Pathology Department
University of California, Riverside
(951) 827 - 4201
emma.aronson@ucr.edu
Relationship: Dissertation project supervisor

Dr. Will Porter

Professor, Environmental Sciences Department
University of California, Riverside
(951) 827 - 1387
william.porter@ucr.edu
Relationship: Dissertation committee member, collaborator

Dr. David Lo

Professor, Biomedical Sciences Department

(951) 827 - 4553

david.lo@ucr.edu

Relationship: Collaborator

Dr. Jason Stajich

Professor, Microbiology and Plant Pathology Department

(951) 827 - 2363

jason.stajich@ucr.edu

Relationship: Dissertation committee member